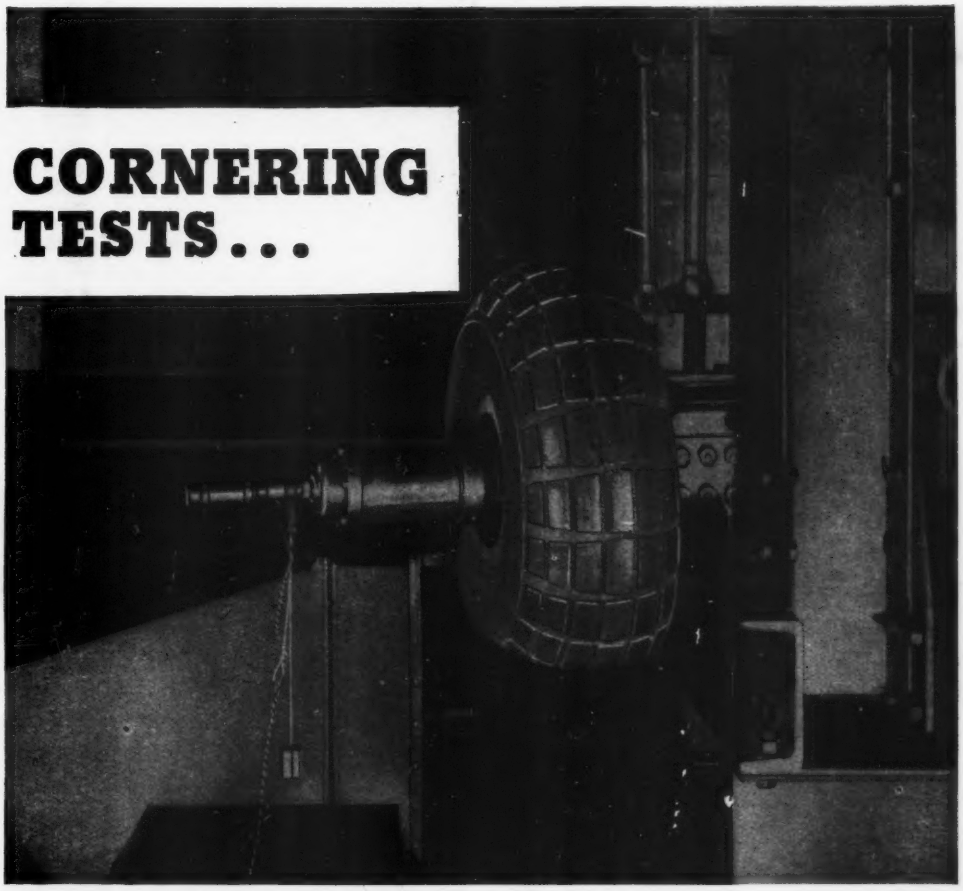
1881 Vol. XLVII JANUARY 11th, 1945

FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB ONE SHILLING



The Nose Wheel and Tyre illustrated was designed specially by Dunlop for fitment to the first British heavy tricycle aircraft — the Armstrong-Whitworth 'Albermarle'

The steadiness of heavily laden aircraft on the ground depends, among other things, on the lateral stability of its tyres. The skew test illustrated reproduces the sideways forces on a tyre due to tur... ...unlop designs a tyre to resist th... Dunlop aero ty... ...contour design to ensure the ... Stability has a special significa...

DUNLOP

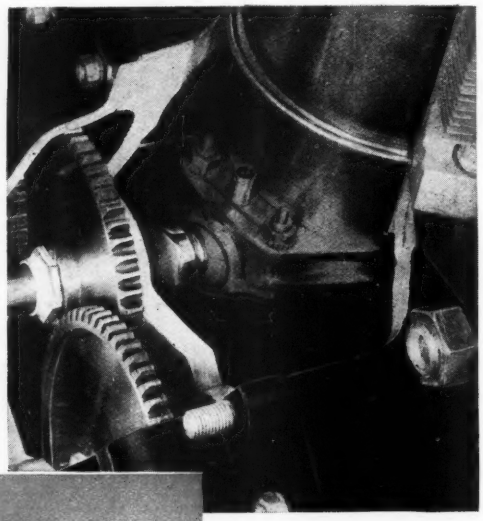
Advantages of the simple sleeve-valve . . . No. 12.

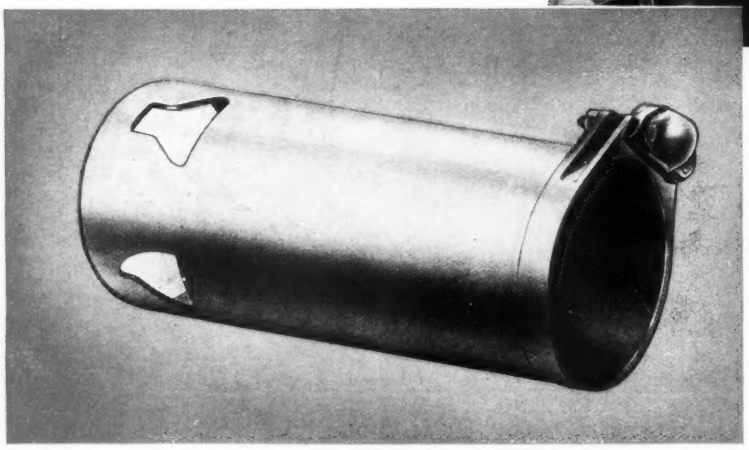
EASE OF ASSEMBLY . . .

THERE is no complicated rocker or tappet mechanism on a "Bristol" sleeve-valve engine. A single crank drives each sleeve through the medium of a ball-joint and a simple train of gears; these are all marked for easy assembly.

When a sleeve-valve is replaced, it is only a matter of locating the ball-joint on the sleeve operating crank and sliding the sleeve down over the piston.

After the ball joint housing is secured to the sleeve driving band, replacement is complete. No springs or rockers have to be fitted. No wonder "Bristol" engines save spares.





This is the last of a series of twelve advertisements prepared for retention, and constitutes a simple story of sleeve-valve advantages. Previous copies are available on request to the Bristol Aeroplane Company Ltd., Bristol.

Perseus, Taurus, Hercules, **SLEEVE-VALVE** *Engines*

"Bristol" pioneered and developed the single sleeve-valve engine

5455

FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1881. Vol. XLVII. January 11th, 1945. Thursdays. One Shilling.

The Outlook

Lord Swinton's Chance

GREAT BRITAIN'S commercial aviation picture looks somewhat gloomy at the moment. Politics, which have never yet done anything very helpful for this cause, have cast their sinister shadows over it. Lord Swinton has returned from Chicago a sadder and, we hope, a wiser man. When the proposal to send him was first announced we commented that this was unfair to Lord Swinton. Subsequent events have amply demonstrated that the handicap under which he was labouring was too great, and the Chicago results, or rather the lack thereof, were scarcely surprising.

So far as the "political" angle is concerned, our main hope now rests on Empire unity. It is to be hoped that the talks which Lord Swinton has had recently with Commonwealth representatives will have cleared the way for a common policy, and the sooner such a policy can be declared in unmistakable terms the better.

There is, however, a second side to the picture—the technical. Here Lord Swinton has an opportunity to go down to history as the saviour of British civil aviation. We shall get over the Chicago setback in time. The effects of the Chicago Charter (or should it be Barter?) can be largely neutralised if, and only if, the Commonwealth realises where its interests lie. Lord Swinton's second great chance, if he will take it, is that of rescuing the British aircraft industry, or at least that part of it which is willing and able to design and build civil aircraft, from the hampering hand of officialdom and red tape. "Rescuing" is the right word. The men are there, at the top; the ideas are there; in many cases the money is there in spite of taxation and the enormous difficulty of scraping enough together for research and experiment. Not only so, but the customers are there, abroad as well as in the Commonwealth. What is wanted is the release of a relatively few men, technicians, draughtsmen and artisans, to speed-up the detail work; and, of course, a few materials.

That does not appear to be asking a lot, especially in view of the opinion so freely expressed by all political shades, that a healthy export trade is an absolute necessity if the standard of living is to be maintained or improved. But until the Government takes an intelligent interest in the subject, and awakens to an appreciation of what flying will mean to the Empire in the future, there is little hope of getting anything done. As our first Minister for Civil Aviation, Lord Swinton should be in a position to impress upon the Government the vital necessity for letting the aircraft industry go ahead with its plans—at least in quite a modest way. Manufacturers are not asking help from the Government, merely that some of the many hampering brakes should be taken off. Lord Swinton could set his hand to no worthier task than that of seeing that this is done, and done quickly, otherwise it will be too late.

Showing the Flag

AFTER a round trip of some 12,000 miles, a Halifax III with Hercules engines and manned by a R.A.F. crew has returned to this country having visited Rhodesia and South Africa. At Cape Town a number of demonstration flights were made over the city and surrounding districts, and in addition more than 1,000 members of the Services were shown over the aircraft. The return journey was made via Bulawayo, Ndola, Nairobi, Khartoum, Cairo and Rome. The machine was commanded by Sqn. Ldr. Clyde-Smith, D.S.O., D.F.C., of the R.A.F.

Such a flight is to be warmly applauded. South Africa has not seen much of British first-line aircraft (a short visit by a Spitfire is about all), and we gather that the Halifax created enormous interest. Although the

South African Air Force uses a number of British types, few of the civil population had seen any "in the flesh," and knew them only from snapshots and letters sent home by relatives in the S.A.A.F. They were impressed by the Halifax.

We very much hope it may be possible to send other British aircraft types to South Africa. American aircraft are a familiar sight in many parts, and visits by British crews would serve as a useful reminder that there *are* others

"Pulling a Fast One"

FIELD MARSHAL SIR BERNARD MONTGOMERY certainly put things in the right perspective last week when he told an assembly of war correspondents that the *Luftwaffe* was still able to "pull a fast one." He also added, equally truthfully, that it was unable to protect the German army. The "fast one" he had in mind was undoubtedly the low-level attack by some 300 fighter-bombers on Allied airfields on the Continent at first light on New Year's Day. The price paid by the enemy was 188 aircraft and pilots. The R.A.F. lost four pilots and the Americans only one pilot.

The number of British and American aircraft destroyed on the ground—which matters but little because we have such a preponderance of aircraft supply—has never been stated. Obviously the Germans would like to know what they got for their money, but our commanders insist that they must find out the hard way by sending over reconnaissance flights. No figures have been issued, but it is unlikely that our aircraft losses were any greater than those of the enemy.

Although the attacks must have caused local surprise it is highly probable that our air command was expecting some such tactics to be employed and was willing to pay the cost.

Since the great breakthrough and advance from Normandy, the retaliatory reply of the German air force has been so weak that it would have been more than foolish to pay a lot of attention to such things as camouflage and dispersal. Unless airfields have metalled perimeter tracks and dispersal areas, maintenance in the winter mud becomes both troublesome and protracted. The percentage of serviceability drops sharply, and by taking too many of these safety precautions one might easily inflict on our own forces the effect of many severe raids by the enemy.

The Me 262 jet-propelled aircraft restored to the *Luftwaffe* the ability to carry out reconnaissance, and their pilots must have seen the ranks of Allied aircraft lined up on each side of the main runways. With it all looking so ripe for a raid the Germans pulled their "fast one" and burnt their fingers in the process.

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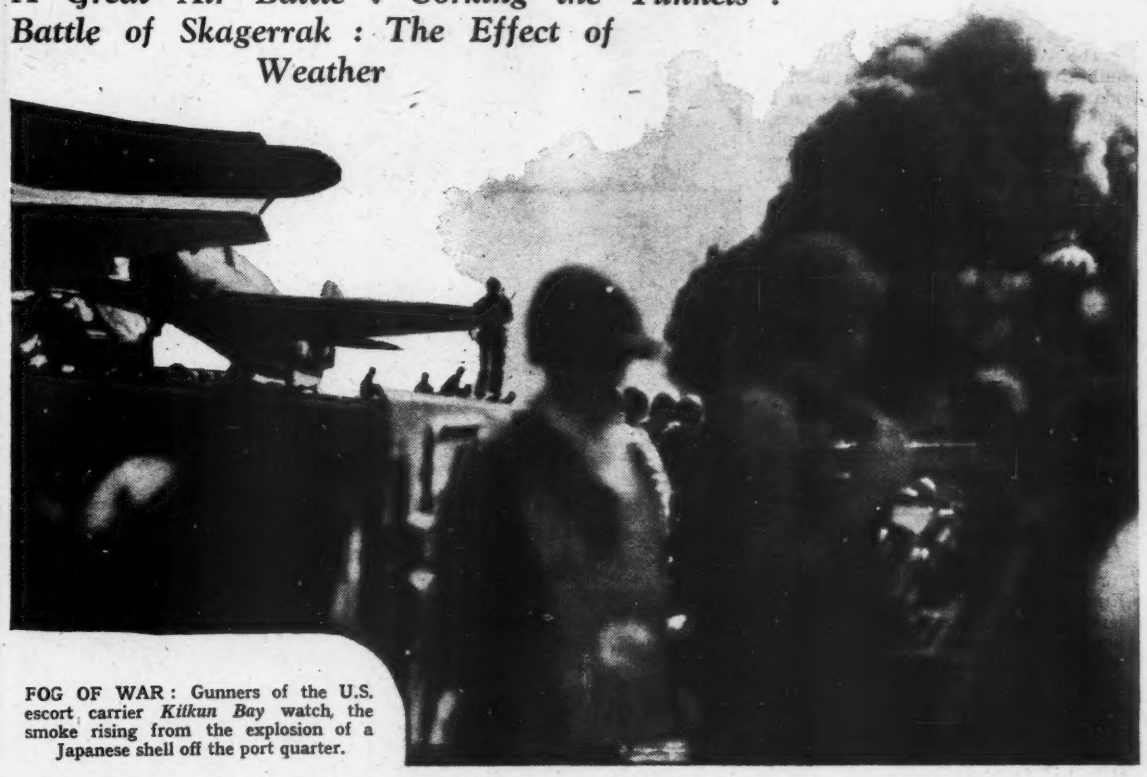
AIR OBSERVATION POST : R.A.F. mechanics servicing a Taylorcraft Auster for the Roya Artillery. The maximum speed of the Auster is 130 m.p.h. which is not very much faster than the landing speed of some of our heavily loaded fighting types.

WAR in the AIR

A Great Air Battle : Corking the Tunnels : Battle of Skagerrak : The Effect of Weather



FOG OF WAR : Gunners of the U.S. escort carrier *Kitkun Bay* watch, the smoke rising from the explosion of a Japanese shell off the port quarter.

NATURALLY it would be very unwise to tell the Germans the exact results of the great air fighting on New Year's Day. One estimate says that the *Luftwaffe* lost 364 machines, of which British and American fighters shot down 155, while the A.A. gunners claimed 209. It is also thought that there were an additional 81 "probables." The Germans have claimed that they destroyed far more; that claim was to be expected and need not be taken seriously. Reliable correspondents have admitted, however, that the *Luftwaffe* met with a measure of success, and that some unstated number of British aircraft was destroyed or damaged, mainly on the ground.

It is noteworthy that the raids are reported to have been made entirely on R.A.F. airfields. Some of these in the liberated districts were probably over-full of aircraft. It does not follow that the casualties to personnel were heavy. It is also unusual for the claims by the A.A. gunners to exceed those of the fighter pilots. The probable reason for that was the surprise nature of the attack and the low level at which the Germans flew.

Generally speaking, it is undoubtedly to our advantage that the *Luftwaffe* should fight as often as possible. We can replace aircraft losses much more readily than the enemy can, and the same applies to pilots and aircrews. Even equal losses would be to our advantage; but it is seldom the case that in a fight the Germans do not lose more machines and men than we do.

A Sad Loss

WHEN one thinks of the enormous number of miles flown during this war by eminent personages, and in particular by the Prime Minister and Lord Wavell, it comes as a shock when occasionally the life of a valued leader is lost in an air accident. The loss of General Wingate was heavy; and now we have to mourn Admiral Sir Bertram Ramsey, whose machine crashed as he was leaving Paris for Brussels. He was one of the outstanding figures of the Combined Operations which have been such a notable feature of this war, and his loss therefore afflicts not only the Royal Navy but the other two Services as well. We may, or we may not, have to undertake more operations of this kind in Europe—that cannot be foretold here—but if we do, Admiral Ramsey will be sorely missed. There will certainly have to be more Combined Operations in the war against Japan; and it will be a great advantage for those in charge to be able to study the methods by which Admiral Ramsey made such a wonderful success of the Navy's part in those which have taken place in Africa and Europe.

Stopping the supply of munitions, etc., to the German front line is still one of the most important services which aircraft can perform in aid of the ground armies. Most of this work is done by the Tactical Air Forces, though the heavy bombers of the strategic air forces have lately been doing a lot of good work on marshalling yards and other centres of communications. Lately, however, another branch of Bomber Command has taken a hand, in a very novel fashion. Mosquitoes of that Command started the New Year by dropping a number of 4,000 lb. bombs into the mouth of railway tunnels which fed the German lines. These heavy bombs hit the ground while still travelling almost horizontally, and disappeared into the tunnel. The pilots had to fly extremely low, and after making the re-

WAR IN THE AIR

lease some very quick work on the controls would be called for to prevent the aircraft making contact with the hill through which the tunnel ran. The bombs had special delayed-action detonators.

The cutting of a railway line for military purposes has always been a matter for judgment. Damage on a straight, open stretch is almost useless, as it can easily be repaired. To bomb the line as it goes through a cutting is the usual ambition, for almost certainly plenty of earth from the hillside will be brought down on the line. Moreover, repair workers are bound to be conspicuous, and can be attacked on subsequent days. But all anti-railway work needs to be planned by railway experts, as it doubtless is being done on the Western Front now. All tunnels cannot be equally important. To block a really important one by an explosion (and such an explosion!) inside must certainly give the maximum of trouble to the most ingenious repair engineers.

Yet Once More

ANOTHER New Year's Day present for the Germans was the draining for the fourth time of the Dortmund-Ems Canal. This was done by Lancasters in daylight. Perhaps the Germans hoped that in time Bomber Command would get tired of bombing this familiar target. At any rate, immediately after the last attack they began repairs, and by working night and day they got the canal into order after five weeks. Six barges were then spotted moving through it. All the result of that great effort was undone in one brief period of bombing. Perhaps the Germans have by now already started to repair it once again—though they must have given up hope that breaching it is an amusement which will pall on Bomber Command.

The attack on German coastwise shipping has lately developed into a regular battle of Skagerrak. Coastal Command is the aggressive party in it, and its Halifaxes have been going out by night as well as by day to catch the oil tankers and other rich prizes and set them ablaze. There are usually formidable escorts, and the British bombers do not always come home unscathed; but the Germans lose a lot of stuff which they are very loth to lose.

Winter Fighting

IN olden days armies used regularly to go into winter quarters, and an unofficial truce was observed until the spring. Marlborough was one of the first commanders to prolong his campaigns well into the winter and the military pundits of his day did not much approve of his doing so.

Winter campaigning now brings special problems of its own. So much depends nowadays on the air that the weather has taken on a new importance, not connected with the hardships of the infantryman trying to sleep in a very cold slit trench. Critics have asked whether the surprise which Rundstedt sprang upon the Allies by his Ardennes offensive was not made possible only by the fact that for some time past the reconnaissance aircraft had not been able to do their work, and that modern commanders have come to rely so entirely on the air that they have neglected other means of gathering information. Well, there are now no horsed cavalry in Western Europe, and if there were it is doubtful whether they could find out much in modern conditions.

Wintry weather and its effect on the powers of aircraft may, perhaps, have another important effect on the present Ardennes battle. Suppose that Rundstedt decided to "call it a day," as the saying goes, and to withdraw his forces from their present bulge lest a worst thing befall, his ability to do so would depend very much on the weather. If it turned bright and clear for a reasonably long period, the Allied Air Forces would almost certainly make it impossible for the German commander to get away without losses which might well prove disastrous. Even in bad weather the going would

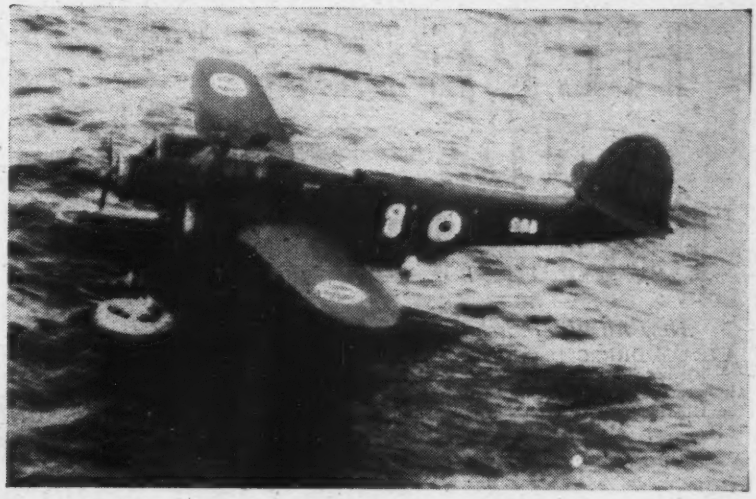
DOWN GERMANY WAY: A remarkable series of photographs showing a salvo of 1,000 lb. bombs falling from an Avro Lancaster. It is interesting to note how the missiles appear to point in different directions, even in the bottom right-hand photograph where they are the farthest away from the aircraft.

WAR IN THE AIR

not be too good; for out of 13 key railway bridges between the battle zone and the Rhine only one had not been destroyed by last week-end. Rundstedt knows what happened to the German 7th Army as it tried to get away from the Battle of Falaise. Perhaps by the time these words are published we may all know what he does intend to do. He is the ablest German commander, we believe, and he is not likely to make the mistake of underestimating air power. Bad weather might save him, and fine weather might break him.

While Rundstedt plays what may be his last trump card (not an ace) in the Ardennes, no little interest attaches to another desperate but belated German effort in the East—namely, the attempt to relieve the forces besieged by the Russians in Budapest. The force which is trying to effect a relief from the north-west advanced over ground frozen hard, which allowed the German tanks full scope for manœuvre. The Russians have been meeting this threat with massed artillery fire and heavy blows from the air. Air reconnaissance must be even more important than air striking power when all dispositions must depend on information of the enemy's movements. The weather in Hungary evidently has been kinder to our Allies than that in the West has mainly shown itself to our Air Forces.

Great satisfaction may be felt at the cessation of the fighting in Athens, but the internal confusion in the country is by no means over. The E.L.A.S. forces have withdrawn from Attica, but they are still a menace. The R.A.F. has been out, following their movements, and the other day it spotted and attacked a transport travelling towards Thebes. It was believed that the rebels in that area were making for Corinth, a city whose rather unique situation enables its holders to cause great trouble to the forces of order and recuperation.



CO-BELLIGERENT TO THE RESCUE: A Cant Z 506B picks up the crew of a Beaufighter which had been shot down off the shores of Northern Greece.

BULGES ON THE AMERICAN FRONT: The new U.S. anti-gravity suit which is described on page 37

TRUNK CALL: The Fleet Air Arm in India adopt the local method of salvaging a Barracuda from the jungle.

BOMBING IN 1944

BOMBER COMMAND and the U.S. Strategic Air Force have issued figures of the bombs dropped on the Germans during last year. The figures are amazing. The two forces between them dropped a total of 1,395,000 tons. Bomber Command was responsible for over 525,000 tons, more than half of which total was over Germany itself. That figure is more than twice the weight dropped in the first four and a quarter years of the war. The Command destroyed 536 enemy aircraft.

The U.S. Air Forces based in Britain and those in the Mediterranean dropped 870,900 tons. They claim to have destroyed 15,318 enemy aircraft, either in the air or on the ground.

This summary does not include bombing by the Tactical Air Forces, by Fighter Command and Coastal Command, or by the Fleet Air Arm.

HERE AND THERE

New Air Vice-Marshal

AIR COMDRE. C. B. COOKE, C.B.E., has been promoted Air Vice-Marshal. He is serving in the Technical Branch of the R.A.F. and received his C.B.E. in 1941.

Barracuda Trainers

THE Fairey Barracuda, reports the S.A.A.F. journal, *Wings*, is among a number of modern types now being used at a Cape naval air station in the training of air crews for service against the Japanese.

Coming of Age

THE British Aviation Insurance Co., Ltd., celebrated its 21st birthday on New Year's Day this year. Capt. Lamplugh reminds us that it is by far the oldest office in the world to have been continuously engaged in covering aviation risks.

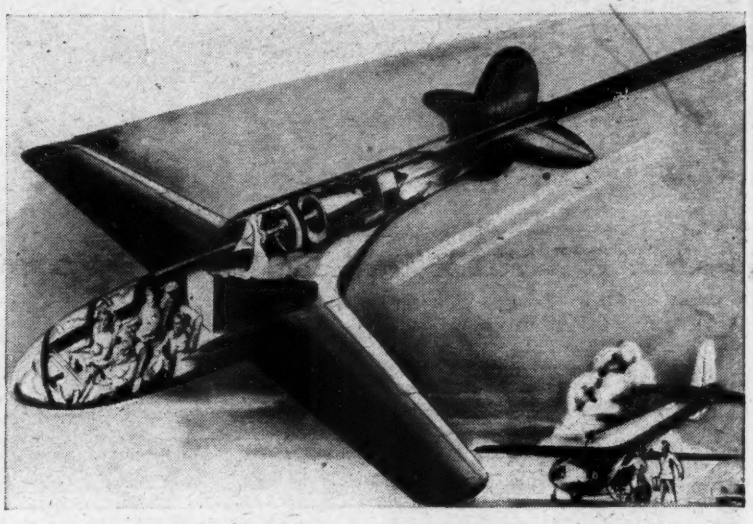
Centenarians

SEVERAL aircraft in the Australian Lancaster squadrons operating with R.A.F. Bomber Command began the New Year with more than 100 operational flights behind them, the top-scorer among them having 118 sorties to its credit.

All Their Aircraft Return

A NEW ZEALAND Spitfire squadron of the 2nd T.A.F. now serving in the Netherlands has the enviable record of not having lost a single aircraft to the enemy throughout the past year.

Their chief job is low-level close-support work, but before D-Day they were engaged in cross-Channel sweeps and bomber escort missions.



FOR FAST WORKERS: This sketch of the "Family" jet-plane of the future recently appeared in the *Mechanix Illustrated Magazine*, which says that the type is now on the drawing board. Pressure cabin, plastic windows and a 2,000 miles range are features mentioned, while on some models control surfaces will be replaced by directional jets. To judge by the inset (showing rear entrance) the plane seems to face a rather threatening future.

Dutch Burgomaster Thanks Airmen

THE thanks of Dutch citizens to British airmen for the Christmas parties they arranged for the local children are expressed in a letter written to Air Marshal Coningham, A.O.C.-in-C., 2nd T.A.F., by the burgomaster of a Dutch town.

Models are Not Toys

"I WANT first to say a word to the ignorant," observed Lord Brabazon when opening the National Exhibition of Model Aircraft at Dorland House, Regent Street, last week, "Models are *not* toys."

The exhibition, which consists of some 500 models—solid scale, flying, and flying-scale models—covers almost every imaginable type. Sizes range from spans of a few inches to more than 10ft., some of the larger ones being powered by petrol engines.

Saying that there were still plenty of discoveries to be made in the field of aviation, Lord Brabazon remarked that we did not yet know if the aircraft of the future would be pulled or pushed through the air, whether it would fly tail first, be all wing or all fuselage, so there was plenty of experimental scope for model builders. The rules of their competitions, he urged, should lead in some definite direction.

The exhibition closes on Saturday.

A Veteran Honoured

WE were delighted to see among the New Year Honours, the name of Flt. Lt. C. L. Pashley, who received the A.F.C. in recognition of his long services to British aviation.

Cecil Pashley, who went out to Southern Rhodesia early in 1941 when Empire air training was being built up and is still there doing E.F.T.S. instruction, has been flying regularly since 1908 and is now 53 years of age. His R.Ae.C. certificate is No. 106.

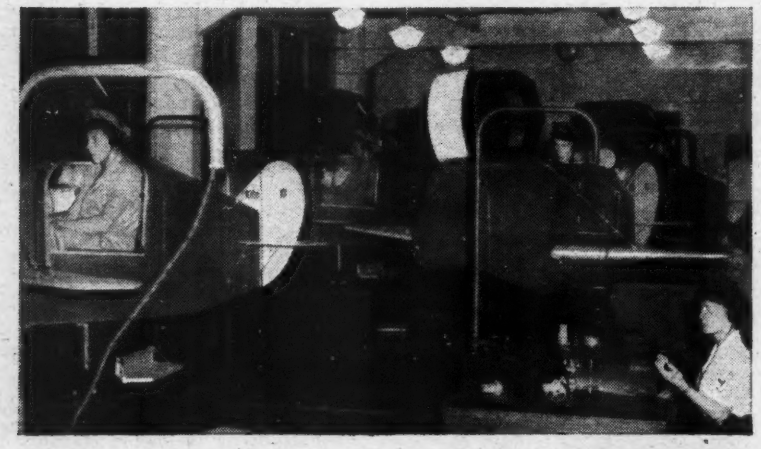
He and his brother ran one of the first civil flying schools in the country at Shoreham well before the last war, and during that war he served as an instructor and on the Admiralty Testers' Register.

In 1939 he was the guest of honour at a dinner in Brighton given to celebrate his 10,000 hr. flying time, and his total to-day is nearly 14,000 hr.

Few instructors can have taught more people to fly than has Cecil Pashley, and we congratulate him on his well-deserved decoration.

The Latest

SINCE the recent occasion when an Aussie Typhoon pilot of 2nd T.A.F. landed at his advanced base with wet Belgian soil, thrown up by his own cannon shells during an attack on Ger-



INSIDE IN FORMATION: British Naval pilots being trained in the Link trainer room at Jacksonville, Florida, for service in the Pacific and Indian Ocean theatres of war. Hundreds of Fleet Air Arm pilots are being trained in America side-by-side with U.S. cadets.

HERE AND THERE

man transport, adhering to the leading edge, there has been a new term in use for low-level attacks on that part of the front.

They call it going in at mud level.

U.S. Armament Switch

THE U.S. is to cut down machine gun production for aircraft, which is ahead of schedule, to release man-power for more critical ordnance items in view of recent appeals for increased ammunition output, the War Production Board announced.

This revision will release some 6,000 workers from five factories when it becomes effective.

R.A.F. Training in Canada

WITH the closing, on February 2nd, of the R.A.F. Training Centre at Port Albert, Ontario, the last of the air schools opened in Canada exclusively for the R.A.F. will disappear. In future Britons will train alongside Canadians, New Zealands, Australians and other Empire airmen.

The R.A.F. dispersal centre at Moncton, New Brunswick, will, however, continue to operate for British airmen arriving in Canada.

Lost with Leigh-Mallory

AMONG the crew of the aircraft in which Air Chief Marshal Sir Trafford and Lady Leigh-Mallory were recently lost, was an Australian wireless-operator-air gunner, Flt. Lt. J. A. Casey, R.A.A.F., a native of Sydney.

Flt. Lt. Casey was posted to a Sunderland squadron after special courses in Britain and, after completing a tour of operations, was signals officer in another Sunderland unit when selected for Sir Trafford's aircrew.

Pioneer in Pneumatics

MR. JOHN HALL, who joined Dunlops more than 50 years ago in the world's first pneumatic tyre workshop in Dale Street, Coventry, and ultimately became works manager of their modern plant, has died in Birmingham at the age of 75.

After retiring in the summer of 1939, when Sir George Beharrell, the firm's chairman, presented him with a silver casket on behalf of his colleagues and the workers, Mr. Hall returned in 1941 to help in the war effort.

With Compliments

A GOLD CUP, the gift of Wing Cdr. E. J. R. Hack, was recently presented to the High Commissioner for South Africa, Mr. Heaton Nichols, by the Air Member for Personnel, Air Marshal Sir Bertine E. Sutton. The cup bears the inscription "Presented by the Royal Air Force to the South African Air Force as a token of comradeship and esteem, 1944."

The presentation took place at the Air Ministry, and among those present was Mr. John Martin, who represented South Africa at the Chicago Air Conference.

Wing Cdr. Hack has given similar cups for presentation to other air forces of the Empire.

Plastics at Play

AIR MARSHAL SIR LESLIE GOSSAGE will be the guest of honour at the annual dinner and dance of the Southern Section of the Institute of the Plastics Industry, to be held at the Polygon Hotel, Southampton, on Friday, January 26th.

The function is being run in conjunction with the Mitchell Spitfire Fund, and tickets, which are 12s. 6d. each, can be obtained from the Hon. Sec., 131, Bellemoor Road, Southampton.

Tribute to the A.T.C.

"NOBODY recognises better than I do the magnificent job the A.T.C. has done—and is still doing," says Air Marshal Sir Philip Babington, Air Officer Commanding-in-Chief, Flying Training Command, Royal Air Force, in a New Year message to the Corps.

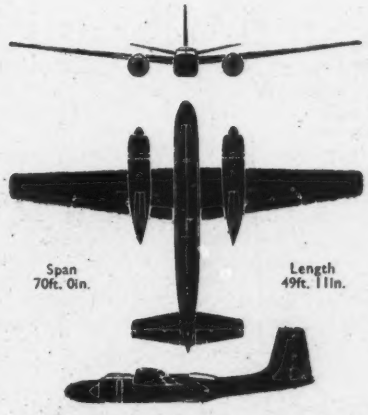
"For many, air crew training started when they joined the A.T.C. Good training can never afford to be static, and is never finished, because new developments are always arising. So it is up to us to ensure that our air training shall be maintained at the highest possible level at all times."

CARGO-CARRIER: Converted from a merchantman, this "baby flat-top" of the Royal Navy carries a cargo as well as providing protection for the Atlantic convoy. It is here seen loading wheat through grain chutes at a Canadian port.

Tough "Taf"

BETWEEN D-Day and the end of 1944, the 2nd T.A.F. recorded 16,000 operations, their total for the year being nearly 20,000.

Altogether they have made more than 1,024,000 sorties against German armour, supplies and transport targets and dropped more than 38,000 tons of bombs—a remarkably good tonnage for a command which does not include any heavy bombers but is equipped with Mustangs, Mitchells, Bostons, Mosquitoes, Spitfires, Typhoons and Tempests.



Douglas A-26 Invader (two 2,000 h.p. Pratt & Whitney Double Wasps.)

For the Next "Ark Royal"

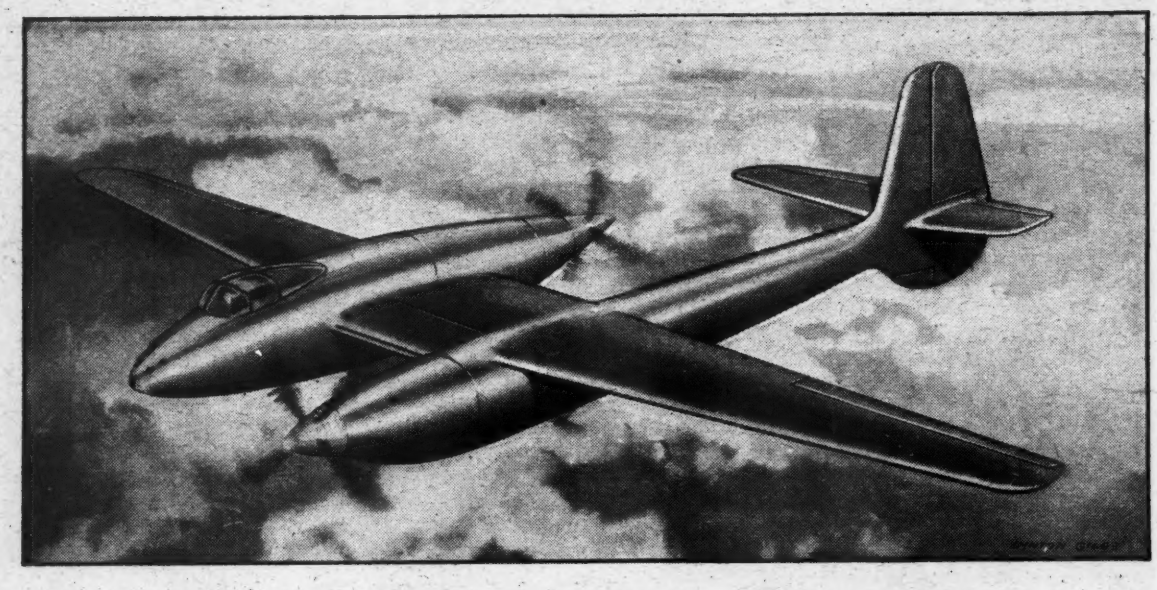
A SILVER ship's bell subscribed for by the surviving officers and men of the aircraft carrier, H.M.S. *Ark Royal*, lost in 1941, will be inherited by the next ship of that name, which, incidentally, will be the fourth of her line.

The bell, which weighs over 2cwt. and measures 19in. across the mouth, was cast last month at the famous bell-foundry of Gillet and Johnson, at Croydon, in the presence of the First Lord and a few of the last *Ark Royal's* officers and men, and it now hangs at the entrance to the wardroom of the Naval Air Arm Headquarters.

At midnight on New Year's Eve the traditional 16 bells was struck by the youngest officer of the station—an old naval custom.

Miles M.60 on Order

MILES AIRCRAFT, LTD., have received an order from the Ministry of Aircraft Production for a number of feeder-line aircraft of their own design to the requirements of the Brabazon Committee. The aircraft, which in the meantime will be known as the M.60, will be a four-engined 14-seater with a crew of two. It has been designed for use in any part of the world, is of all-metal construction and fitted with a pressure cabin if desired. The maximum range on standard tankage will be 1,000 miles.



Asymmetry Again

Suggested Fighter for a Global Air Force

By ROGER TENNANT

SOME years ago a Royal Air Force officer suggested that asymmetrical aircraft might have advantages. Shortly afterwards we published a German design based on a patent specification, and a little later the actual machine made its appearance in the war. Mr. T. P. Wright sent us a copy of a patent taken out before the German by the Wright Corporation, which seemed to establish his claim to having been the first to appreciate the possibilities of a lopsided layout. To the best of our knowledge the machine was never actually built

The present author advocates this arrangement for a long-range fighter, and gives his reasons for believing it to be the best for this particular purpose

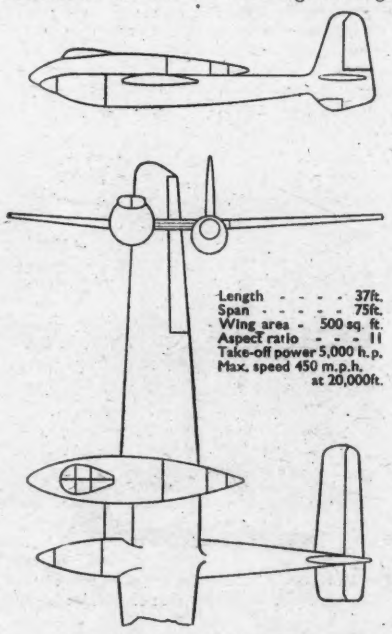
THE development of the Superfortress has created a new conception of air strategy—the "global air force," designed to make air-power independent of outposts on land. This is a strategy developed, in the first case, solely to meet the exceptional conditions of the war against Japan, for which extreme bomber ranges are necessary.

But even when the menace of Japan is removed, it is a conception particularly attractive to the United States, for the development of such a "global air force" on a large scale would give America the chance to police the world, if necessary, without being dependent on overseas possessions or allies. Nor can England afford to neglect the building of such a force. The cost?—Well, we must accept that as the necessary insurance premium for our own security and that of our Empire.

The value of bombers with effective ranges of 4,000 miles or more will depend to a large extent on the ability to produce fighters capable of escorting them. Constant changes in the relative armament and tactics of bombers and fighters make it impossible to say that any type of bomber will always be capable of fending for itself, even though it may at the outset show that it can.

Construction of a fighter with an effective range of, say, 4,000 miles which, after flying half that distance, can fight on something like equal terms with the short-range fighters of the enemy, is no simple task.

The notes which follow suggest, roughly, the form that such a fighter might take, and the opinions that have led the author to this conclusion. The possibilities of jet propulsion have not been considered in this instance, because it seems very unlikely that a sufficiently economical jet engine will be available in the immediate future.



Assuming that a range of more than 4,000 miles is to be provided, we can start with the following basic assumptions:—

(1) Two engines will be needed to give fighter speed to such a necessarily large aircraft.

(2) For maximum economy it must be possible to cruise on one engine only.

(3) To keep the size and weight to a minimum, the fuel for the outward journey should be carried in a container that can be jettisoned when empty.

(4) For cruising economy a high-aspect-ratio wing is essential.

(5) Navigation problems and long endurance make a crew of two essential and three desirable.

(6) For fighting manœuvrability, weights must be concentrated as near the c.g. as possible.

(7) As the density of a heavily loaded high-aspect-ratio wing will be high, only a small proportion of the petrol load will be accommodated in the wings.

If we start by reviewing the physical bulk of the main items that have to be carried, we can discuss the best basic outline of a machine to contain them.

Assuming for a moment that our aircraft will be able to cruise at 250 m.p.h. on 1,300 h.p., it will need an endurance of 16 hours at that speed, plus a fighting allowance of, say, one hour, at nearly full throttle. That means about 1,500 gallons of petrol. If 600 gallons for the outward journey can be carried in some form of jettison tank, and 100 gallons can be accommodated in the wings, that leaves 800 gallons to be carried in the fuselage or nacelles, requiring about 130 cubic feet.

Possible Layouts

Two engines of, say, 2,500 h.p. for take-off, will require about 60 cubic feet each. A crew of two will need at least another 60 cubic feet. These items can be arranged in several possible forms:—

(1) The conventional twin nacelle and fuselage combination.

(2) A central nacelle and twin booms, as in the Lightning.

(3) With the engines buried in the fuselage and shaft drive to the nose, as in the Airacobra, or to the tail.

(4) With the engines in the fuselage and right-angle shaft drive to the airscrews in front of or behind either wing, as in Major Seversky's, and several other projected long-range fighters.

(5) As an asymmetrical combination of a nacelle and pusher airscrew, and tractor airscrew and fuselage, as in the accompanying illustrations.

Layout (1), though accepted as the orthodox form, is particularly unsuitable in this case because, as already pointed out, to obtain the necessary economy in fuel consumption, provision must be made for cruising on one engine only. The large yawing couple produced when a conventional twin is running on one engine would considerably reduce the cruising efficiency. In any case, this arrangement has many inherent disadvantages, of which the turbulent flow from the necessarily short nacelles and the destruction of laminar flow over a great part of the wing are important factors in the present design.

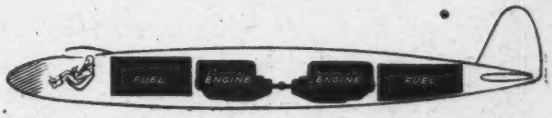
No. (2) eliminates turbulent flow from the nacelles to the tail, but is otherwise no better than (1).

No. (3) has attractions, but in the present instance the power would appear to be too great to be absorbed by one airscrew unit. If a five-bladed airscrew is necessary to absorb 2,000 h.p. at great heights, then for 4,000 h.p. one would have to visualise a ten-bladed contra-prop. After the air had passed through that, it would probably be resolved into its constituents of hydrogen, oxygen and nitrogen, and though this might have surprising effects on the boundary layer, it probably would not give very much traction.

No. (4) is the best of those considered so far, and has generally been accepted as the form for any long-range fighters or fast bombers of the future. For cruising, one engine can turn both airscrews. To keep the centre of gravity right it will normally be necessary to make the airscrews tractors rather than pushers, so that although the nacelle bogey is removed, the slipstream will still destroy laminar flow over much of the wing. In the case of a very-long-range fighter such as we are discussing, however, this arrangement does not fit in so well because of the sheer bulk of fuel and engines to be accommodated.

As already laid down in our basic assumptions, weights must be concentrated as near the centre of gravity as possible. Now, to get all our weights together near the c.g. in one fuselage would mean piling engines and petrol tanks on top of one another, which is obviously impossible. Stringing them out along the fuselage, as would have to be done (see diagram), would be bad for manœuvrability, and, carried to excess, bad for stability.

Is there a better solution? I venture to suggest that the asymmetrical arrangement provides one possible answer.



Weight dispersal: This diagram shows, in somewhat exaggerated form, the heavy items distributed along the fuselage, an arrangement which gives rise to large moments of inertia and therefore reduces manœuvrability.

A combination of a nacelle and "pusher," with a tractor airscrew and fuselage, offers the following advantages:—

(1) Best possible concentration and balance of weight.

(2) Yawing couple when cruising on one engine materially reduced, as compared with the conventional twin.

(3) No shaft drive required, except a short extension on the pusher.

(4) When cruising on the pusher engine only, there is no interruption of the air flow over the wings.

(5) Wetted area and structure weight at the minimum.

(6) Turbulent flow from short nacelles eliminated.

The main features of the suggested layout are obvious from the diagram. Although there is probably no particular aerodynamic advantage in wing radiators, fitting them to the leading edge of the centre section would further the cause of concentration of weight. The fuel load is split between the nacelle and the fuselage, the greater part being in the fuselage.

The nose of the nacelle provides a convenient receptacle for the armament, which could be made up from such combinations of cannon and machine-guns as tactical considerations require at the time. The pilots can be accommodated in a side-by-side pressure cabin behind the guns.

The Specification

By careful design, perfect balance between thrust and drag could be obtained without needing any correcting force from the rudder. When running on one engine, with the other airscrew feathered, correction should be well within the limits of the trimming tab.

Assuming internal capacity for 900 gallons of fuel, the remaining 600 gallons to be carried by methods discussed later, I think that the following rough specification could be filled by an aircraft of this type:—

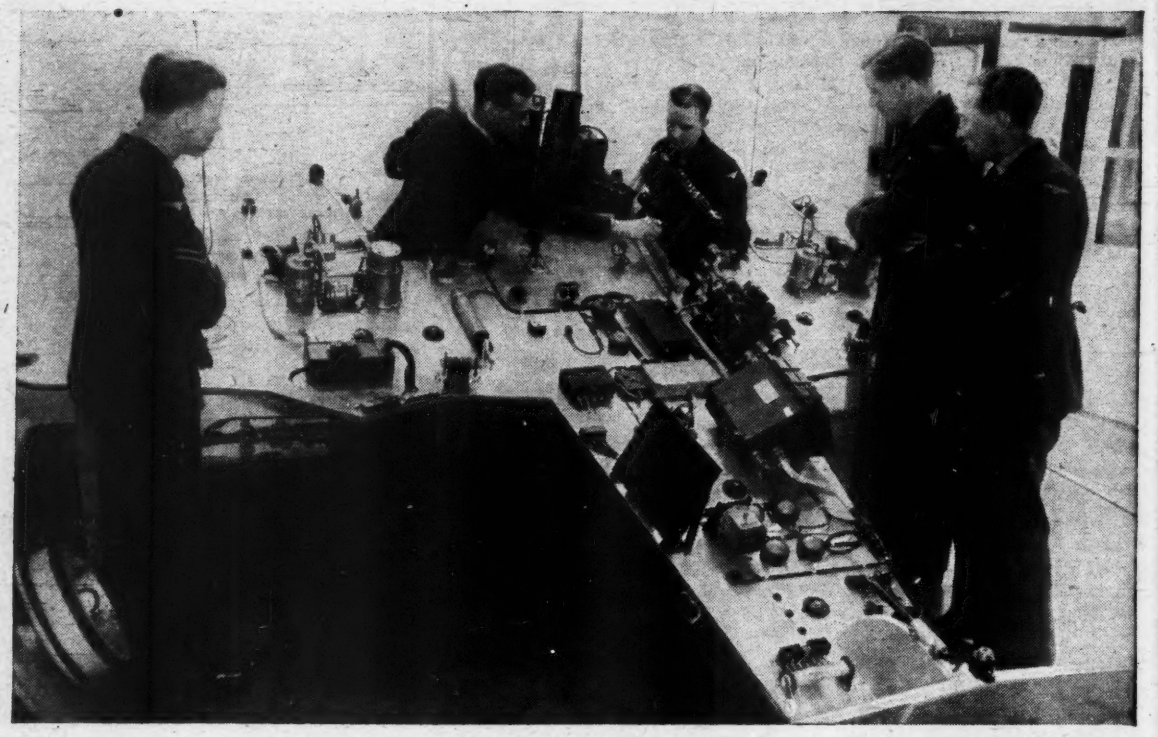
Take-off power	2,500 h.p. per engine.
Span	74ft.
Length	37ft.
Aspect ratio	11.
Wing area	500 sq. ft.
Tare weight	20,000 lb.
Gross weight (take off) .	29,000 lb.
Wing loading (take-off) ..	58 lb./sq. ft.
Power loading (take-off) ..	5.8 lb./h.p.
Max. speed	450 m.p.h. at 20,000ft.
Absolute range	5,000 miles.

Consideration of how best to carry the fuel for the outward journey suggests the employment of a glider consisting virtually of a streamlined fuel tank with wings and tail surfaces. It would be towed by the fighter, the tow rope forming a pipe-line.

This glider would weigh about 5,000 lb. loaded, with a high-aspect-ratio wing of lighter loading than that of the fighter. At take-off it would become airborne first, and slightly assist the take-off of the larger machine.

With the layout suggested, it would be necessary to cruise on the tractor engine whilst towing the glider. The offset drag of the glider would then balance the drag of the asymmetrical nacelle. The pusher airscrew would be used on the homeward journey.

[The notion that, because its wing loading is lower than that of the fighter, the glider would help to take-off is intriguing, but one rather doubts its validity. Even on the assumption that the tow-rope, in this case the pipeline, is pointing up at some 45 deg., the engine of the fighter, via its airscrew, still has to overcome the *drag* of the glider, which is added to the drag of the fighter.—ED.]



Demonstration panel for the various electrical equipment and circuits. When not in use the panel is stacked flat against the wall.

Mosquito School

R.A.F. Technical Training Command Manufacturer's Course

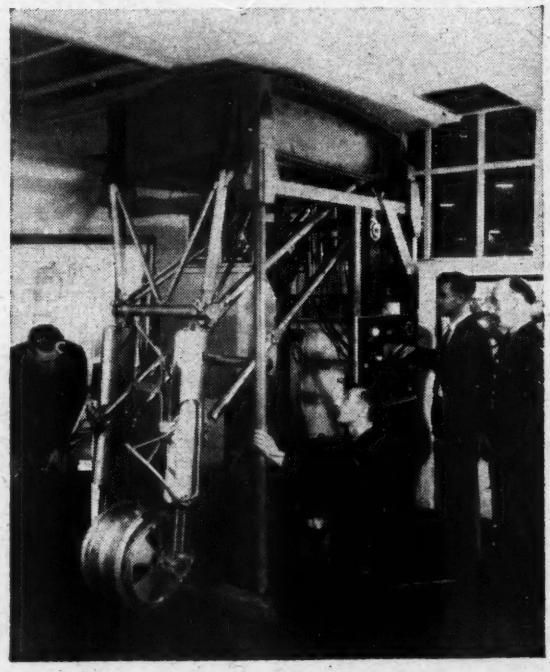
SHORTLY after the outbreak of war, R.A.F. Technical Training Command were faced with the acute problem of providing training for a huge and increasing personnel in the handling, repair and maintenance of aircraft and all the diverse equipment ancillary to them.

The aid of the manufacturers was invoked for the purpose of instituting at the factories instructional courses which selected personnel could attend. The venture was a great success, and the extent of the scheme was widened as more and more concerns came within the orbit of M.A.P. These manufacturers' Courses have done and are doing an excellent job, and with the advent of the Mosquito, the De Havilland Aircraft Co., Ltd., were asked to start an instructional school on similar lines to those already in existence at other firms.

When the school was started in the autumn of 1941, the average intake of students was four or five each week, and to date no fewer than 2,500 students of all nationalities have passed through. There are two courses available, the air-frame course of one week, with an average intake of 36 students, and the repair course, which lasts 14 days, with an average intake of 16 students.

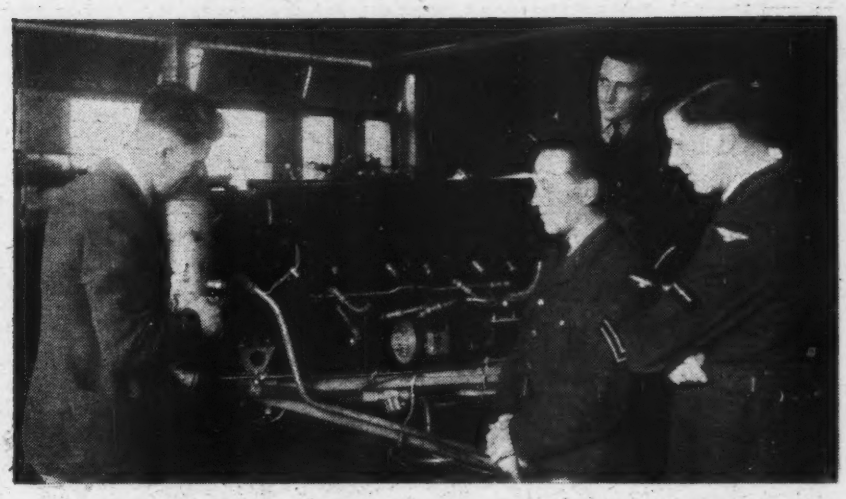
Personnel from the R.A.F., W.A.A.F., B.O.A.C., A.T.A., and Fleet Air Arm have been instructed on the intricacies of the Mosquito, as well as men from the Allied Forces, Czechs, Poles, Belgians, Norwegians, Yugoslavs and Americans.

Great use is made of sectionalised components and mock-ups as a means of physical demonstration to amplify



Instruction on operation and maintenance of the undercarriage is facilitated by this full-size, powered mock-up which was constructed entirely from salvaged parts.

MOSQUITO SCHOOL



A Merlin engine is used for demonstrating the various intricacies of the power unit installation and accessories operation.

the classroom lectures, and it is worthy of mention that every single component and unit used for demonstration in the school is salvage—nothing was abstracted from the production lines to furnish the school with demonstration equipment.

As may be seen from the accompanying illustrations, the mock-ups and demonstration panels are excellently arranged to afford students the very least difficulty in grasping the principles and essentials of the various services. In each case where motion is involved, for example the undercarriage, pneumatic and hydraulic systems, etc., the layout panels and mock-ups are supplied with a power source so that operative actuation can be clearly shown.

The electrical services demonstration panel is particularly ingenious, the various control panels, components and their respective wiring circuits being positioned appropriately on a board shaped approximately in the aircraft's plan-form. This allows the students to walk around and follow the several circuits involved and, at the same time, gives a graphic representation of the particular dispositions. The demonstration panel is arranged on runners with counter-weights so that, when not in use, it can be swung into a vertical position flat against the wall and so save space.

Seeing Them Made

Classroom instruction is facilitated by the use of large-scale diagrams mounted on each side of easels fitted with casters, so enabling them to be wheeled about as required. In addition to the instruction given at the school, students are taken on conducted tours of the main works and the various dispersed factories, where they have the opportunity of seeing at first hand the various aspects of the aircraft under construction.

From experience it has been found that instructional time is lost by the necessity of students making their notes during lectures, and that mistakes inevitably occur due to the student attempting to divide his attention between his notebook and the lecturer. To minimise confusion the salient points to be dealt with during the course are arranged to coincide with the syllabus lecture notes given to each student, and as a further aid, the back of each page is left blank for any additional notes or sketches the student may wish to make. The lecture notes provided contain many diagrams which save the student time in making them personally as well as precluding the possibility of his making mistakes in drawings or annotation.

Billeting and messing for non-commissioned personnel are arranged as part of the school, but officers have to make their own arrangements locally. An excellent feature of this particular school is that both the De Havilland Senior Staff Club and the Works Social and Sports Club extend honorary membership to students for the duration of their course.

The school is run by the De Havilland Service department under the supervision of Mr. A. J. Brant, with Mr. D. W. Richardson as chief instructor. Mr. Richardson is assisted by two civilian instructors and three senior N.C.O. instructors of R.A.F. Technical Training Command.

There can be no doubt as to the value of the work the school is doing in keeping our fleets of Mosquitoes at maximum operational serviceability.

ANTI-G SUIT FOR FIGHTER PILOTS

A SIMPLE but effective means of protecting the fighter pilot from the effects of excessive "positive g" during violent manœuvres is now in general use with U.S.A.A.F fighter pilots, and was demonstrated to *Flight* last week by Capt. Donald W. Johnson, a Mustang pilot of 339 Fighter Group.

As most readers will already know, the centrifugal force set up by quick changes of direction at high speed, such as when pulling up sharply out of a dive, or making a tight turn at high speed; virtually results in the pilot's weight being temporarily increased. So long as the increase is not more than, say, 2½ to 3 times gravity, the fit man feels no ill-effects, but the performance of the modern high-speed fighter aircraft is such that, in combat, the pilot may have to perform manœuvres which will impose a load of perhaps six times gravity—6g or even more. This causes the blood to be drained away from his head into the lower parts of his body and the almost immediate result is a black-out; not a good thing during a mix-up with a "one-ninety."

The problem, then, was to prevent this drainage of blood from the head, and it was discovered that this could readily be done by exerting a balancing pressure on the lower parts of the body.

Experiments were carried out at Wright Field (the American equivalent of Farnborough) and the final result was the Berger G-2 suit now in use. This is not really a suit in the accepted sense of the word, but an arrangement of five bladders, linked by straps, which fit over the pilot's stomach, thighs and calves and is worn inside the normal flying suit.

The five bladders are connected by an air-line to the exhaust side of the engine-driven vacuum pump, via a spring-valve which is automatically opened as g is increased. The action is progressive and thus the amount of pressure admitted to the bladders and thereby applied to the lower parts of the pilot's body and legs is automatically adjusted to the degree of g being exerted upon him. In effect, the same g force which is trying to drain the blood away from his head is made to operate in the opposite direction through the bladders and thus maintain a balance; so far as the pilot's physical properties are concerned, the g cancels itself out.

"We have been using this suit for some little time," Capt. Johnson told *Flight*, "and it does the job perfectly. No matter how tight the turn or how quick the pull-up from a dive, the pilot stays perfectly normal. This gives him a double advantage in that not only is he safe from blacking-out, but he does not have to bother about trying to ward off a black-out and so can look around and give his whole attention to the job in hand."

HELICOPTERS

Four-seater design, proposed by Dohner and Lippincott from specifications prepared by author.

A Survey of the Stage of Development Reached by the United States : Possibilities of the Class

By
C. B. F. MACAULEY

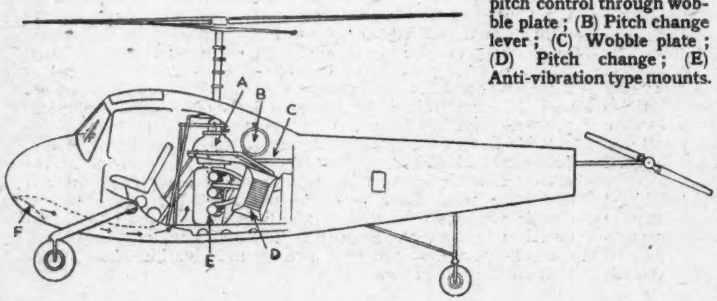
FROM time to time we have kept our readers informed of helicopter development at home and abroad. In the present article our American contributor surveys the U.S. field and draws attention to certain tasks already accomplished and others for which this class of aircraft is especially suitable. He points out, as we have previously done, that the helicopter is not as yet the aircraft for everyone, but that it is at present in the transition stage between the purely experimental and the really practical.

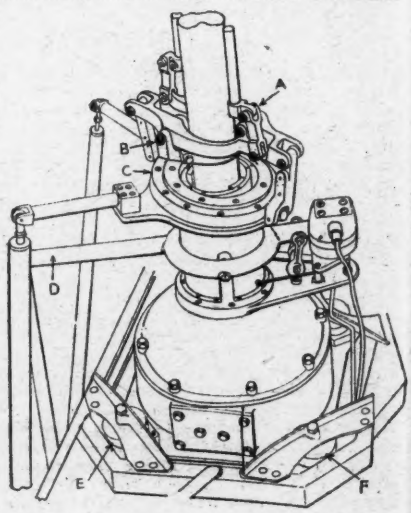
The sketches of the Bell helicopter were prepared by the author and are published here by arrangement with our New York contemporary Aero Digest.

HELICOPTERS are at present in transition from the experimental to the practical. To-day they are in sight of their goal, for some of those now flying are truly practical in that they perform functions reliably and efficiently which can be accomplished by no other vehicle.

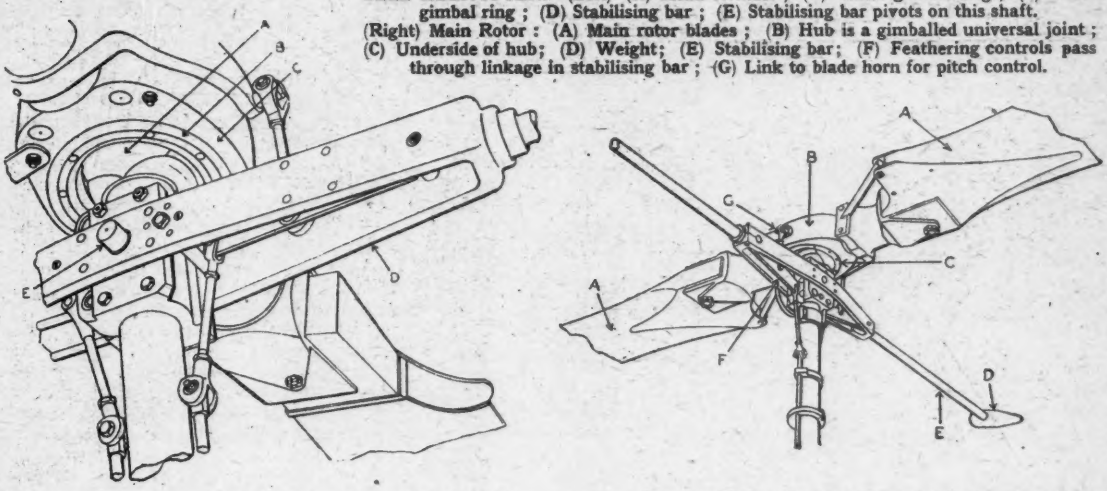
Their development has made giant forward strides under the impetus of wartime necessity, and commercial applications will begin as soon as the war is ended. The operational experience accruing to helicopters of the military and naval forces of the United States and other Allied nations also contributes to the development of a safe, reasonably economical, small-family-sized helicopter within reach of middle-class incomes. However, the dedication of all industry and constructive effort to winning the war has left little time or money and few facilities for direct experimentation to develop personal helicopters.

Despite all deterrents there are a number of far-sighted companies with great faith in the future of the family helicopter and with the courage and the means to persevere in bringing about that future. Among the hope-





(Below) Side elevation of the Bell helicopter ; (A) Transmission ; (B) Fuel tank ; (C) Drive shaft transmission to auxiliary tail rotor ; (D) Oil Cooler Intake ; (E) Franklin 6-cyl. opposed engine ; (F) Air scoop to cooling fan. (Right) Pitch control linkage. (A) Linkage for cyclic pitch control through wobble plate ; (B) Pitch change lever ; (C) Wobble plate ; (D) Pitch change ; (E) Anti-vibration type mounts.



BELL HELICOPTER.—(Left) (A) Head of mast ; (B) Inner gimbal ring ; (C) Outer gimbal ring ; (D) Stabilising bar ; (E) Stabilising bar pivots on this shaft. (Right) Main Rotor : (A) Main rotor blades ; (B) Hub is a gimballed universal joint ; (C) Underside of hub; (D) Weight; (E) Stabilising bar; (F) Feathering controls pass through linkage in stabilising bar ; (G) Link to blade horn for pitch control.

fuls who are vieing for superior sales appeal in the civilian market of to-morrow are Bell Aircraft Corporation, Aeronautical Products, Inc., and Higgins Industries, Inc., each of whom is pioneering a two-seater coupé design. Frank N. Piasecki, of the P. and V. Engineering Forum, and Stanley Hiller, of California, have been flying promising single-seat sporting models.

Other Projects

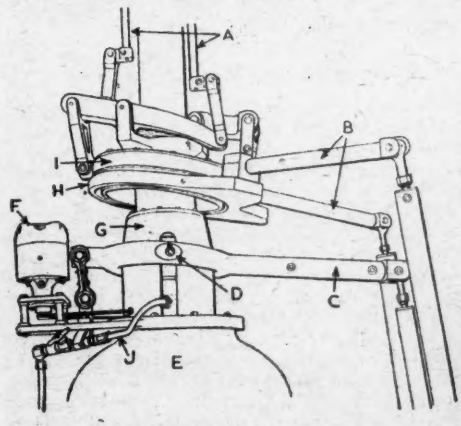
Still other designs are weathering their birth pangs. One, under the Fleetwings Division of the Kaiser-Cargo Corporation, enjoys the sponsorship of Henry J. Kaiser, who has predicted that the helicopter when further developed will occasion tremendous industrial and engineering activity. Kellett Aircraft Corp., of Philadelphia ; Landgraf Helicopter Co. ; G. and A. Aircraft Co., a division of Firestone ; Bendix Helicopter, Inc., and many other forward-looking organisations, are also spawning helicopters which they will send forth to try their whirling wings in the post-war world.

It would be a mistake to infer that the Bell Aircraft Corp. helicopter is ready to go into production. The two Bell helicopters are housed at the Gardenville plant near Buffalo, N.Y., and are being used for continuous experimentation and modification—but the day of their maturity is not too far off.

The design which originated on Bell's drawing boards succeeded in overcoming to a great extent the instability, excessive vibration and difficulty of control which have long been serious obstacles to satisfactory helicopter operation. Arthur M. Young, Bell designer, wrestled with these problems for fifteen years. His solution embodies a two-bladed rotor whose position in space is governed not by the position of the mast to which it is attached but by a stabilising bar which acts as an artificial horizon and renders the rotor independent of the fuselage. Because of this feature, the machine evidences stability in flight and ease of control.

The blades are rigidly connected to the hub, which is mounted on the mast by a cardan universal joint, so that one can feather the blades by rocking the entire hub unit about the longitudinal axis of the blades without the necessity of twisting each blade individually in its bearings.

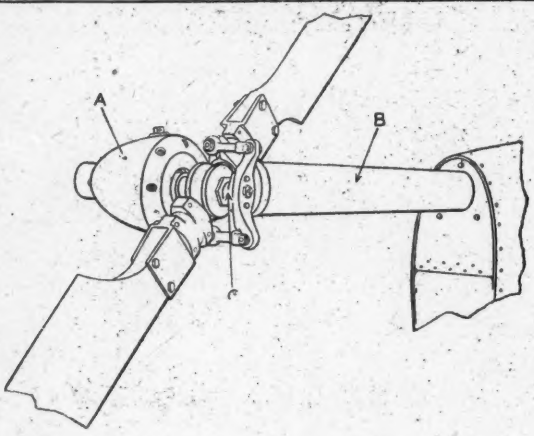
Using a single main rotor, the Bell helicopters have a conventional auxiliary anti-torque airscrew on the tail, and the particular model just described has a 140 h.p. Franklin six-cylinder engine. Pilot and passenger sit side-by-side and are afforded an excellent view on all sides by transparent plastic panels. The machine will cruise efficiently at 80-90 m.p.h. and achieve a maximum speed of at least 100 m.p.h. Weight is 1,550 lb., including pilot. It will rise vertically and hover with an additional load



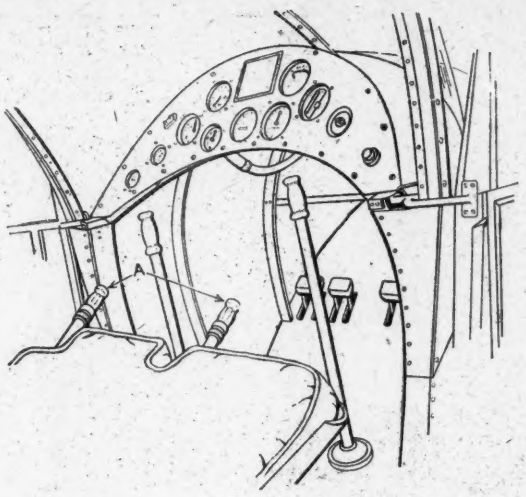
BELL HELICOPTER.—(A) Push-pull rods govern blade pitch ; (B) Cyclic pitch control levers ; (C) Collective pitch control ; (D) Outer mast raised and lowered at this point ; (E) Transmission cover ; (F) Tachometer ; (G) Cam ; (H) Bottom of wobble plate does not rotate, but tilts in any direction ; (I) Top part of wobble plate rotates with mast ; (J) Transmission oil.

A front view of the Bell helicopter with the rotor at rest.

HELICOPTERS



Bell auxiliary tail rotor for torque counteraction. (A) Reduction gear, 2 : 1 ; (B) Tubular shaft housing torque drive from transmission ; (C) Pitch controlled by chain and sprocket at opposite end of shaft through hollow axle.

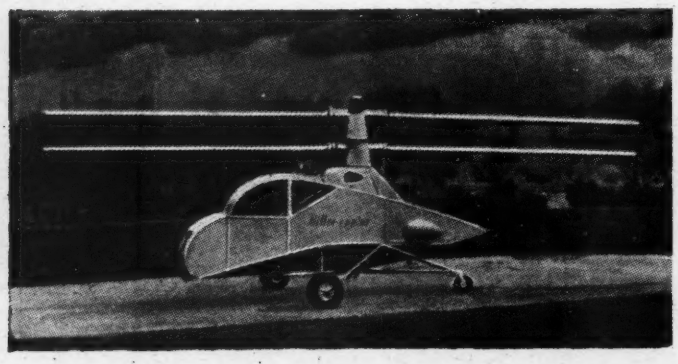


The cabin of the Bell Helicopter, showing dual controls. (A) Grip controls throttle ; raising and lowering the lever at the left of the pilot's seat controls main rotor pitch for climbing or descending.

of 220 lb. which may be dead weight or a passenger.

A "free-wheeling" device is used in the Bell helicopter so that it can descend safely in event of engine failure or fuel exhaustion. In fuselage construction, strong longitudinal beams provide a "cradle" which supports the engine mounting and the cabin. The engine, clutch, transmission, drive shaft and rotor assembly form an integral unit which is attached to the engine mounting by means of four rubber mounts ; these absorb much of the vibration often found in other helicopters. Inside the cabin are a simple instrument panel and three controls: the stick for tilting control of the main rotor ; the rudder pedals for controlling direction of the fuselage ; and the lever at the left of the pilot's seat for pitch control of the main rotor blades.

The helicopter developed by Aeronautical Products, Inc., has its engine in the nose of the machine (unlike most of the other designs). A chain drive transmits power to the rotor and the rotor shaft. This helicopter resembles the Sikorsky conception more than the Bell, having a single three-bladed main rotor. The shaft of the main rotor is rigid with respect to the fuselage, and when the main rotor is tilted the entire craft tilts. The controls consist of stick, rudder pedals and a lever which controls pitch of the blades of the main rotor and the throttle. Details of the control system have not been released by the company, but it is said to be simplified in comparison with other similar designs. In other models now under construction by Aeronautical Products, Inc., flight control is obtained by a wheel, eliminating the stick-and-rudder combination employed in the prototype.



The Hiller helicopter has contra-rotating rotors of 25ft. diameter.

Another two-seater helicopter venture has been backed by Andrew Jackson Higgins, shipbuilder and manufacturer of cargo aircraft. Plans for the Higgins helicopter may be credited to the Italian pilot and designer, Enea Bossi, who came to America shortly after World War I. The body of this craft resembles that of a small two-seater light plane, except that there is no engine in the nose, and instead of tail surfaces the rear part is tapered and curved upward to support a small tail rotor.

Chief distinguishing characteristic of the Higgins helicopter is the four-bladed main rotor which, like that of the Bell helicopter, tilts as a unit in the direction of flight while the fuselage remains level. Its maximum speed is about 125 m.p.h. The Higgins helicopter is powered by a 180 h.p. Warner radial engine, mounted horizontally on the floor of the fuselage with its crankshaft connected to the rotor mast through a clutch, transmission and free-wheeling unit. A control stick between the pilot's legs governs the direction of flight. Rotor control differs from the Bell method. Test flights on the Higgins two-seater helicopter were interrupted this spring by minor damage to the rotor, but when the vehicle is properly developed it should sell for about $1,500—in peacetime.

Contra-rotating Rotors

A clever little job is the helicopter designed and built by 19-year-old Stanley Hiller, jun., of Berkeley, California. Hiller's helicopter is one of the first successful co-axial contra-rotating jobs, eliminating the need for a tail rotor. Much secrecy still surrounds this newly developed vehicle, which incorporates a number of radical devices. The machine will be financed by Hiller Industries, a die-casting firm with which Stanley and his father are associated. The production model is expected to have a 450-mile range. The helicopter has a 12ft. steel-and-fabric fuselage and is powered by a 90 h.p. Franklin engine. Its two-bladed rotors are 25ft. in diameter. Maximum forward speed is said to be about 100 m.p.h. The Civil Aeronautics Administration issued to Hiller the first experimental licence ever given for a helicopter in California, and Army and Navy officials have watched a number of flight demonstrations.

Late in 1943 a single-seater 1,000-pound model was put through

HELICOPTERS

its paces at Washington, D.C. This model, designated the PV 2, is similar to the Sikorsky design and has a three-bladed main rotor with a diameter of 25ft. It also uses the principle of cyclic pitch control to lift the plane of rotation of the main rotor in the direction of flight. Torque is compensated for by a small auxiliary rotor on the tail, only 5ft. in diameter. Here again rudder action is accomplished by changing the pitch of the tail rotor.

Frank Piasecki's PV-2 is powered by a Franklin four-cylinder air-cooled engine developing 90 h.p. The engine is mounted with the crankshaft in a vertical position. To lessen vibration the engine is set in rubber mountings, and a universal joint in the drive shaft is provided to compensate for movement of the engine. Maximum speed is about 90 to 100 m.p.h., and will probably be increased with refinements in design.

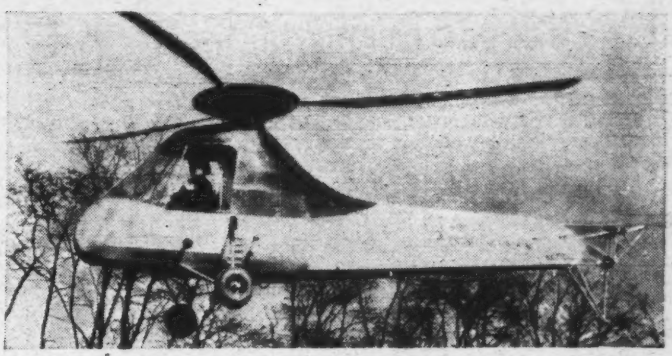
The company also described another model which was in the blue-print stage at that time, and which was designed to carry a pay load in excess of one ton with a range of 400 miles. This size helicopter would carry eight or ten passengers with baggage. In addition, the company was planning a two-seater model which would be only slightly larger than the PV-2.

The helicopter is not sufficiently advanced to play a very important rôle in World War II, but the military and naval services are now getting deliveries of helicopters in considerable numbers. Much information as to their uses is restricted for reasons of military security. However, we do know that they are now being used with great success as ambulance craft for emergency evacuation and for observation purposes. In spite of adverse weather conditions, difficult terrain, or roads congested with men and materials advancing to the battle zone, helicopters can transfer the wounded to well-equipped base hospitals without delay or hindrance.

Coastguard Work

It was a Coastguard version of the XR-4 which convinced many a scoffing reactionary of the potential value of helicopters when it was used to deliver blood plasma to the stricken survivors on a Jersey beach after the explosion of the U.S.S. *Turner*. The rescue craft on that occasion took off from Floyd Bennett Field, dropped in at Battery Park, picked up the plasma from a Red Cross truck, and proceeded with ease and despatch through a blinding snowstorm which paralysed harbour traffic, landing on the Jersey beach. Many lives were saved.

The helicopter's capabilities as a rescue craft were further demonstrated when a boy was dramatically rescued from Jamaica Bay, near New York. Fifteen-year-old Harry Lundmark, of Brooklyn, and his pal Charlie Peterson, hired a rowboat one Saturday to go fishing in the bay. During the afternoon, Charlie deposited Harry on a sandbar about a half mile off shore and rowed off to fish elsewhere, intending to come back later. Charlie got stuck in a marsh, however, and had to be rescued. A plane sighted Lundmark on a windswept sandbar. The weather was pretty rough, but Lt. W. C. Bolton took off in a helicopter from Floyd Bennett Field, landed on the sandbar and picked up the Lundmark boy, who was none the worse for his adventure.



Frank Piasecki demonstrating his latest helicopter which is claimed to have a top speed of 95 m.p.h

Air/Sea Rescues

The presence of a pontoon-equipped helicopter in the vicinity of any major marine tragedy would unquestionably result in saving many lives. The helicopter can pick up survivors without difficulty either from rough water or from the deck of a disabled vessel. When filled to capacity with survivors, the helicopter can still drop food or drugs into the very hands of men on life rafts or afloat in the sea; it can also drop lines to tow stragglers to life rafts or larger rescue craft on the surface.

Military thinking considers the helicopter well adapted for spotting artillery fire, flying liaison missions in advance of established airfields, and night missions behind enemy lines. With engine exhaust muffled and having no airscrew noise, it could operate in almost absolute silence. The helicopter would be less vulnerable to enemy attacks than a liaison plane because, having no wings, it is more difficult to spot and presents a smaller target. Suitably camouflaged, the helicopter hovering stationary in the air near the ground would be difficult to spot by enemy aircraft patrols. It can also transport personnel and critical materials to strategic locations. As an elevated observation platform for direction of artillery fire, it can maintain contact with ground units by direct line telephone or two-way radio.

On low-pressure floats the helicopter can land on any kind of surface; ground, water, swamp, solid ice, thin ice or snow. It needs no prepared landing field, hence can operate with the most advanced units of the Army ground forces. The helicopter can fly when ordinary aircraft cannot. Under conditions of zero visibility it can practically feel its way through the air, flying around trees and over buildings and other obstacles.

• Navy tests have revealed that the helicopter is also well suited for convoy duty and anti-submarine patrol. Not requiring much storage space, and able to land and take off from a hatch cover, the helicopter is a splendid form of ship-borne aircraft. Tests conducted last year comprised 162 landings and take offs from a special platform on the deck of a large troopship, proving beyond a doubt the feasibility of shipboard operation. One of the helicopters

The Sikorsky R.6 which has been developed from the XR-4. Excellent view all round is obtained by the Plexiglass cabin.

HELICOPTERS

was equipped with standard wheel gear, the other tried out with floats, and it was found that there was little variation in result between the two.

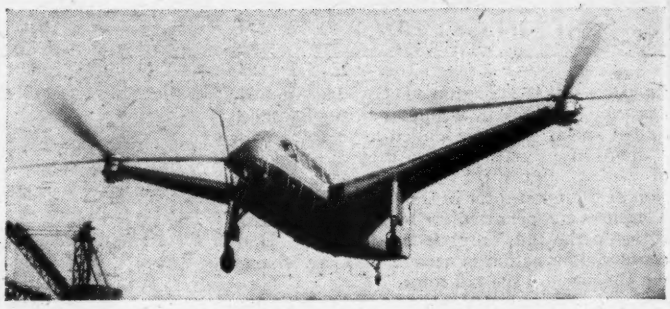
In anti-submarine warfare if the submarine is surfaced, the helicopter does not provide an easy target and is capable of erratic manœuvring to escape the U-boat's guns. In patrolling or searching, its moderate speed permits the occupants to spot surface craft quite easily, and if anything suspicious comes into view, the machine can stop and descend immediately to investigate. Once the sub. is sighted, the helicopter can keep it in sight until other craft are brought to the scene, or if the helicopter is equipped with bombs, it can attack. Recent dummy tests have proved that bomb-carrying helicopters are capable of amazing accuracy, the best score being achieved not while hovering but while making a slow glide approach to the target.

Heading the military roster are the Sikorsky Models XR 4-5-6. Sikorsky's VS-300, which came out in 1939, was the first to find a workable solution to the insistent problem of torque reaction. In the VS-300 Sikorsky balanced the torque of the main rotor by means of an auxiliary rotor mounted on an outrigger and revolving in a vertical plane.

The XR-4 was the first model to be delivered to the A.A.F. The Army and the Navy each have a number of XR-4s in use, and some of this model went to Britain. Controls comprise stick, rudder pedals and pitch control lever with which the throttle is synchronised. Here, again, the rotor shaft is mounted rigidly with respect to the fuselage. The entire shaft of course tilts slightly in the direction of flight, but it is a result of the control, not the cause of it. The control is actually accomplished solely by blade-pitch changing. The main rotor blades may change pitch simultaneously, which controls climb, or cyclically, which controls direction of flight, or in any combination of the two.

Record Flights

The Sikorsky XR-6 recently proved its practical worth and broke all helicopter records when Col. H. F. Gregory, of the U.S. Army Air Forces, and Ralph Alex, Sikorsky engineer, flew 387 air miles from Washington, D.C., to Patterson Field, Dayton, Ohio. This of course was the longest non-stop helicopter flight to date. During that flight the helicopter was in the air 4 hr. and 55 min.; longer than any helicopter had ever stayed up before. It crossed the Alleghenies at 5,000 feet; higher than any helicopter had previously flown with an equivalent load. It attained the best cross-country helicopter speed; 80 m.p.h. ground speed despite strong head winds.



The Platt-le Page helicopter also has twin rotors. The outriggers which carry the rotors are streamlined and of ordinary wing form.

Experimental Crash

The XR-5 and XR-6 Sikorsky helicopters embodied great advancements over their prototype. The R-5 was originally intended as an observation craft. Its first flight a little over a year ago was the occasion for a sad debacle, for when the ship was about 70 feet in the air its tail broke off and it was only by a miracle that the test pilot was able to force it into a controlled glide. As it hit the ground a landing strut was knocked off. The plane careered madly, then turned over and over in a dizzy spin, finally hurtling to destruction. The pilot, amazingly enough, escaped uninjured. But *nil desperandum* was the motto, and when the R-5 took the air again—and again— as time went on, she demonstrated splendid performance characteristics and excellent load-carrying qualities.

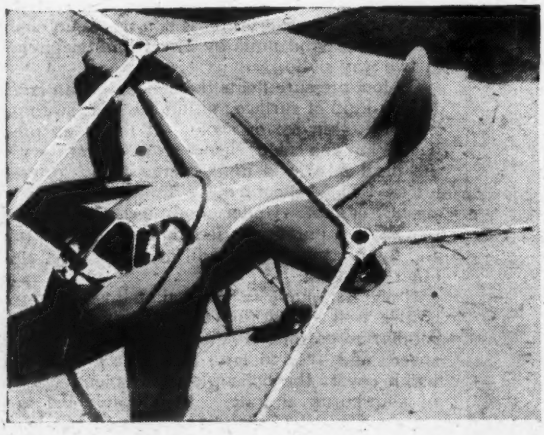
The R-5 differs in seating arrangement from the R-4; an R-5, built for two, seats its occupants one behind the other, whereas the two people in an R-4 would find themselves side-by-side. The R-5 engine is more powerful and its rotor larger than those of other helicopters.

The R-6 is a well-designed, attractively streamlined aircraft, the latest thing in helicopters. In the cabin of the XR-4 view is entirely unobstructed forward, upward and to either side. Additional transparent panels in the side, nose and floor, provide good view at downward angles and directly underneath as well. The cabin of the XR-6 also offers almost perfect unobstructed view, but this cabin is constructed from one single piece of Plasticglass. The 245 h.p. Franklin motor of the XR-6 drives the helicopter at a maximum speed of 110 m.p.h. or more.

Platt-le Page Co. have concentrated their efforts on a two-rotor helicopter whose design is similar to the German Focke-Wulf idea. Heavier than any other helicopter now in use, this machine weighs about 4,800 lb. and is powered by a 450 h.p. engine. The rotors turn in opposite directions, counteracting each other with respect to torque effect and thus averting the necessity for a tail rotor.

These machines and others which have been pressed into war service will be turned to vital commercial purposes in the years immediately following the war. Thereafter helicopters for private ownership will come more and more within the public ken until mass production is inevitable. One thing is certain. We stand on the threshold of a new industry—and few are the variations which will remain untried in the helicopters of the vast unexplored to-morrow which awaits us beyond the war-reddened horizons of to-day.

[One point to be borne in mind is that, when all the control and stability problems have been solved, the helicopter requires more power for vertical than for slanting take-off, a fact which will be against the cheap low-powered type.—ED.]



In the Landgraf machine the twin-rotor arrangement is preferred. Every effort has been made to preserve a "clean" exterior.

Saint Landing System

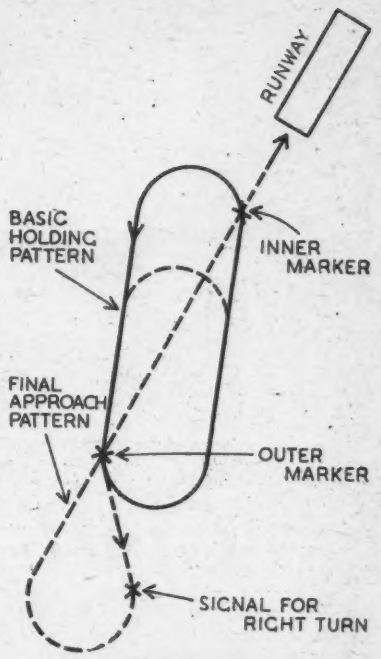
Airport Traffic Congestion Relieved by New Approach Control

FOUR times the present air traffic can be accommodated at airports by use of a control system developed by Capt. Samuel P. Saint, engineering pilot for American Airways, and the General Railway Signal Co., and demonstrated recently at La Guardia Field, New York City, in the presence of 60 officials of the principal airlines, the U.S. Army and Navy, and the Civil Aeronautics Authority.

By use of the system, five transport aircraft, flying under simulated instrument landing conditions, were directed to landings on a single runway in 16 min. 40 sec. More than one hour would be required for the same operation under present procedure.

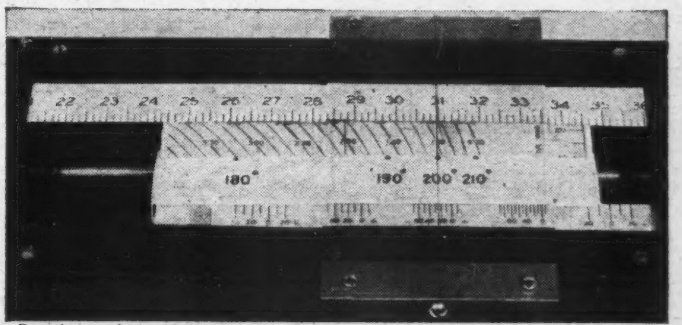
Simplicity of operation of the new system and absolute control over aircraft movements are the most important developments achieved by the inventor of the system. This utilises two radio markers and a device resembling a slide-rule. The markers are used in conjunction with direction-finding equipment in the aircraft for the purpose of holding aircraft to levels separated by intervals of 1,000ft. altitude—the basic altitude separation that has proved reliable during years of operation. The radio markers, however, are at present located 3½ miles apart and confine the altitude holding-pattern to a much smaller and more efficient area. An accompanying diagram shows this pattern for all altitudes of 2,000ft. and higher.

The slide-rule-like instrument shown in the photograph is used for directing a pilot from his position at 2,000ft. in the holding pattern to a position over the outer marker at a predetermined time for the final landing-approach. Spacing of flights on the final-approach path is done by simple instructions to the pilots without disturbing the basic altitude separation between them.



(Right) The black oval is the holding pattern on which aircraft fly while being brought down to 2,000ft. at minute intervals. The broken line shows a typical final approach path from the outer marker, guided by the controller.

(Below) The Saint computor which takes care of drift.

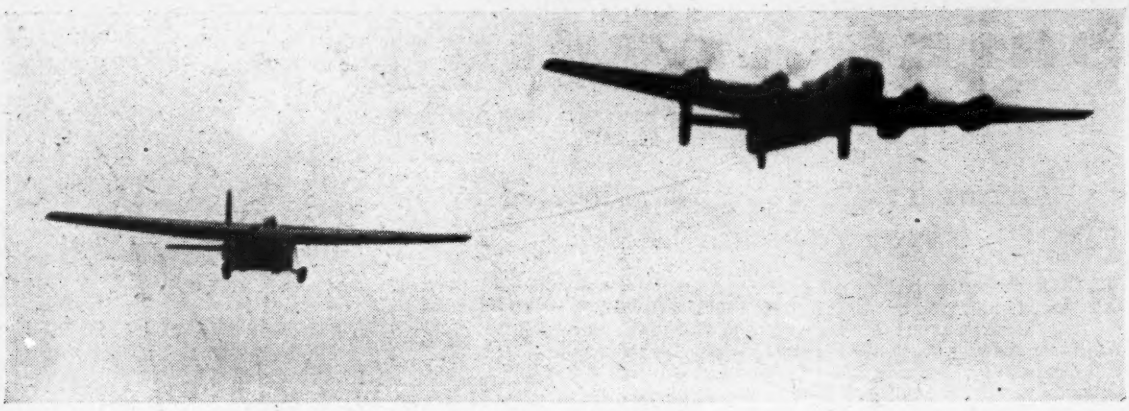


EVERYTHING UNDER CONTROL: The control room at La Guardia Field during the demonstration of the new landing system, when five aircraft were landed on one runway inside 17 min

When an incoming aircraft has been brought down at 1min. intervals from the 5,000, 4,000 and 3,000ft. altitudes, and is still flying on the holding pattern at 2,000ft., the procedure is changed for the final approach. The pilot is told by the controller that his path is clear and he then takes the shortest path to the outer marker that can be made with a normal turning rate. One such path is indicated by the broken line on the diagram. Upon arriving over this marker, he reports to the controller and starts his final approach.

The controller then gives the pilot a heading towards which to fly, and follows with two other signals—one when the pilot's path is clear for a descent to a level of 1,200ft. and the last when the aircraft ahead has landed and the runway is clear. This clearance signal is received before the pilot has passed the outer marker on his final approach. When he is over this marker, he reports that he is vacating the 1,200ft. level and making a normal descent to the runway.

Saint's calculating computer is required by the controller in these final operations to take account of the effect of wind direction and velocity on the final-approach pattern, and its principles are to be incorporated in an automatic control system.



INVASION EXPRESS: A Halifax towing a Hamilcar glider which carries about eight tons of cargo.

Civil Glider Trains

WARTIME SUCCESS—DOUBTFUL FUTURE

THE striking success of gliders in military operations has produced a wave of enthusiastic speculations and optimistic predictions as to their future. The glider has, in fact, gone through the complete swing of the pendulum. While in pre-war days, at least in this country and in the U.S.A., far less attention was paid to its development than it deserved by its potentialities, the rapid wartime progress has brought the glider to a dazzling height of success.

But does the military achievement necessarily warrant a peacetime career?

Pre-war history of the glider is as colourful as its change in the course of this war from a German weapon to that of the United Nations. Before the war the Germans, at least in their initial air programme, concentrated on the development of gliding and later continued to employ it widely for pre-military training. The Russians, while stressing the training of parachutists, were nevertheless not blind to the possibilities of the glider, as witnessed by the fact that 14 out of a total of 19 records registered with the F.A.I., were held by them.

The glider was an ideal instrument for familiarising large numbers of young men with the intricacies of the air, to make them not only air minded but air conscious and, what is more important, air confident.

Wartime Progress

Both in Russia and in Germany the idea of using gliders for the transport of freight was experimented with before the war. In fact, it was Russia which first introduced the system of towing gliders behind power-driven aircraft. In Germany the N.S.F.K. Standarte 15 at Brunsberg is said to have experimented successfully with glider trains comprising four gliders.

But since then the glider has travelled a long way. In carrying capacity and operational technique the dainty glider of the early days of the war has become a robust carrier. While German gliders employed at Crete carried about 10 men each, the CG-4A carries 15, the Horsa 25, and the Hamilcar a tank. Really heavy loads became glider borne for the first time in the Allied invasion operations in France and in the Far East. For the first time, too, gliders landed at night under conditions where no aircraft could survive.

The advocates of the post-war commercial use of the glider derive their arguments from two wartime performances: the glider train and the pick-up technique. Some years ago it was shown that a powered aircraft can tow one, two, or more gliders. The three-engined Ju 52 is said to have been able to tow three light gliders in V-formation over an effective range of about 300 miles. A twin-engined cargo aircraft can tow at about 150 m.p.h. two of the Waco CG-4s, each weighing over 7,000 lb. when fully loaded. Towed to 25,000ft., they can glide 25 miles from the point of release.

Coupled with recent improvement in equipment and the technique of flying pick-up, here is the setting for the gliding enthusiast's post-war planning.

The Civil Aspect

A glider tug train of two or three gliders, it is said, while carrying passengers and freight could be operated economically between points A and D with drop-offs and pick-ups at B and C.

Technically all this is possible. In good conditions a glider requires about 25 yards' landing run and an aircraft-cum-glider combination increases substantially the former's cargo-carrying capacity.

For war employment such considerations as the advantage of landing men and material outside the heavily defended airfields in rough terrain and at pre-selected points with the element of surprise, these and other tactical advantages may be decisive. But the moment normal economic considerations come into play, these virtues of the glider train recede in most cases. First, the drag reduces the cruising speed considerably. Since the latter is inversely proportionate to operational costs the consequences are, on one hand, the admitted increase of payload, on the other increased expenditure. In addition, the lower the speed the narrower is the competitive margin between airborne and other means of freight carriage. Other disadvantages are increased wear and tear on the tug's engines due to the need of higher power output for cruising, difficulty in cooling and lubrication, etc.

Compared with an overloaded aircraft, the tug combination is at considerable disadvantage. DC-3s employed by the American SCAT (South Pacific Combat Air Transport Command) are reported to have frequently taken off at more than 32,000 lb. gross weight, and aircraft normally certified by the C.A.A. for a gross weight of 25,250 lb. have taken off at over 30,000 lb.

It has been calculated that in take-off qualities the glider combination is superior to the overloaded aircraft. But while the practice of overloaded aircraft cannot be

seriously recommended for regular civil operation, it does retain the advantage of higher payload speed, lower operational cost, less crew, and better range.

In fact, range is the Achilles heel of the glider train. Interesting calculations by Klemin and Walling (J. Aeron. Sc. Vol. 10, No. 6, June, 1943, and *Flight*, August 19th, 1943) based on comparative characteristics of the Lodestar alone and towing one, two and three gliders of 13,800 lb. show among other things the overshadowing advantage of the aircraft-glider combination in payload increase, but accompanied by a serious reduction in speed and range. Based on a constant altitude of 5,000ft., and with normal full tanks, the range dropped from 1,800 miles for the tug alone to 1,100 miles with one, 800 miles with two, and 600 miles with three gliders.

The over-riding consideration in aircraft operation, the increase of payload, is thus the one indisputable feature of the glider train. But is this consideration really over-riding without qualifications? Admittedly it is the aim in civil aviation, but the ways and means to reach it are of grave concern to the operator. For long-distance operation airborne traffic has one main competitive advantage: speed. A reduction in cruising speed of the order of 25 per cent. does not only lower this competitive difference, but the higher payload is likely to be offset by the resulting cost of operation and increased rates. Again, in the present position of airborne traffic, consideration of cost per ton/mile is of first importance. Coupled with this, the increase in personnel, and the difficulty of doing blind flying, combine to reduce the glider train's chances.

The operation of glider trains seems to be confined to, and only justified under specific conditions, such as the absence of landing fields when the ability of the glider to be picked up as well as landed can be utilised. But here, again, practical considerations may cancel out hypothetical advantages; although in certain difficult terrains or isolated areas the glider may bring the advantages of air traffic, one glider in tow should adequately serve that purpose. It is unreasonable to imagine that an area which generates sufficient traffic for a regular schedule should remain without landing facilities. Without that steady frequency, on the other hand, the glider train would be debarred from any possibility of scheduled operation and would be reduced to tramp operation. For such, it may serve a good purpose.

On the logical assumption that traffic-generating areas soon establish normal landing facilities, it follows logically that, apart from casual application, glider-borne freight will be left to the small isolated localities where the expense of establishing an airport is not warranted. For such traffic a pick-up service combined with parachuted freight seems a much more economic proposition. Both pick-up technique and parachute equipment have made tremendous strides and relatively substantial loads can be now operated in this manner. Moreover, the employment of parachutes gives aircraft the necessary flexibility, reduces capital and operational costs, and permits the use of normal aircraft as a "task force."

The possibility of passenger-carrying glider trains has been deliberately omitted here. For some considerable time, pending substantial improvements, the comforts of glider operation are not such as to warrant their use for passenger transportation. Nor is one inclined to believe that passengers, if accommodated in the tug, would happily tolerate their appendix. It is possible that another 25 years will produce that nonchalant attitude of the travelling public, but to suggest this at present seems as Utopian as to expect passengers to be parachuted over their back-gardens while the aircraft continues its undisturbed, economic non-stop flight.

CIVIL AVIATION NEWS

REVIVAL

THE Finnish Air Transport Company announces that an agreement has been reached with the Soviet Union, according to which Finnish aircraft may resume air traffic between Finland and Sweden, co-operating as formerly with the Swedish Aerotransport.

The service was scheduled to begin last week.

AN INDIAN RECORD

DURING the year ended June 30th, 1944, the Indian National Airways, Ltd., flew approximately 850,000 miles on services on behalf of the Government of India and the Armed Forces. The passenger traffic produced a high figure of 3,725,000 passenger-miles, and a total of 474,000 traffic ton-miles was accomplished.

These operations had been carried out by Indian pilots and Indian crews, and the majority of the ground staff were also Indian. The Directors are planning the Company's future operations, and as soon as aircraft become available they propose to re-equip with a fleet of large and up-to-date air liners.

THE MERCURY—

MORE specific details are now available of the Martin 202 Mercury which is to be built by Glenn L. Martin Company in three versions: a 30-passenger model providing for a forward freight compartment, a 36-passenger type with less freight space and a 12-passenger version of which more than half is a large freight compartment.

Final specifications of this low wing design are: Length 76ft. 7in., span 80ft. 10in., wing area 765 sq. ft., gross weight 33,500lb., empty weight (30-passenger type) 22,235lb., fuel capacity 600 gal.

The cruising speed at 10,000ft. is 254 m.p.h., max. speed (at 8,500ft.) 314 m.p.h., and ceiling 28,700ft.

—AND THE PACKET

THE Fairchild C-82 Packet cargo aircraft which is soon to go into scheduled production was illustrated in *Flight* of January 4th. It was be powered by either Pratt & Whitney Double-Wasps or Wright Cyclones. The Packet carries 18,000lb. useful load up to 22,100lb. overload.

The main compartments are 8ft. wide, 28ft. long and 8ft. high, and the forward lower section is 8ft. wide, 10ft. long and 6ft. 6in. high. Although the capacity is about 2,300 cu. ft. (as compared with the Commando's 2,775 cu. ft.) the spaciousness of the Packet enables the handling of very bulky cargo allowing for easy accommodation of a 2½ ton truck.

Cruising speed at 10,000ft. is said to be the same as that of the Commando or over 200 m.p.h.

LOOKING AHEAD

AMERICAN domestic air-carrier express ton-miles flown during 1943 were almost five times 1940's total; passenger miles flown per passenger fatality were four and one-half times that of 1936. The 1943 report of the C.A.A. which published this information states further, that from July 1st, 1942, to August 5th, 1944, its war training effort furnished more than 300,000 partially trained pilots for the U.S. Forces.

In addition to its direct war effort duties, the C.A.A. has an ambitious planning for peace programme, including facilitation of the reconversion of the industry, the construction of 3,050 new airports, a 20,000,000-dollar modernisation of radio and a stimulation of aeronautical education and flight training by Federal aid to colleges.

SURPLUS SALES

SIXTY-SIX twin engined Douglas and Lockheed transports have been declared "surplus" and allocated among American and foreign airlines.

Of this total 24 DC-3s have been allocated as follows: Aktiebolaget Aerotransport, Sweden, five; Cia Mercantile Anonima Iberia, Spain, three; Cia Mexicana de Aviacion, three; Cia Nacional Cubana de Aviacion, Cuba, two; Direction des Transportes Aeriens of France, five; Panair of Brazil, three; Sabena of Belgium, three.

Three Lockheeds were allocated to the Linea Aeroportial Venezolana of Venezuela and one to the Navegacao Aera Brasileira of Brazil.

It is stated that many foreign airlines have not yet made formal applications.

"Indicator" Discusses Topics of the Day

Control Considerations

The Need for New Ideas in Aileron Conception : "Unfeeling" Servo Assistance : Are Speed Ranges Becoming Too Great for Conventional Layouts? : The Possibilities of "Spoilers" and the Effect of Automatic Control on Design

IT is always interesting and instructive to attempt to sort out and rationalise one's impressions after a first flight in a new type—particularly as these first impressions are probably the most correct and truly comparative of any. Later ones are coloured by circumstances, or levelled out by familiarity, and are not of much value. One can learn to like almost any kind of aircraft handling qualities and to prefer almost any control layout, and it is only unfortunate that even one's first ideas are always partly based on prejudices developed by undue familiarity with other types. Because of this one's impressions must be rationalised if they are to be of any interest.

A very large number of unimportant points tend to cloud one's judgment and we have all known occasions when a pilot has vaguely stated that he "didn't think much of it," yet, after questioning, it is discovered that the controls happened to be on the stiff side from purely mechanical causes, that the throttle was erratically damped, or, for instance, that the A.S.I. couldn't quite be seen behind the gyro gun-sight. Such small criticisms have quite unconsciously given the new pilot a bias out of favour with the aircraft.

The Much-used Aileron

Nevertheless, I think one is right in claiming that the feature which, above all others, is used as a basis of judgment more often than any other is the aileron control in its relative lightness and efficiency. The effect may again be almost unconscious in the pilot's mind, but it is there for the very simple reason that this control is used very much more often than any other. It is, in fact, in almost continuous movement from the moment of leaving the ground, and the variation in lightness and heaviness between different aircraft of the same type is the cause of the often-heard remark that "there's nothing wrong with it, but I simply don't like it; its not a nice aircraft." Any reasonable aircraft flies level without elevator attention once it has been properly trimmed, and the rudder, at any but comparatively low speeds, is nowadays an almost unused appendage on most types; the undercarriage control isn't touched once the lot has been retracted; the throttle stays in much the same place once it has been brought back to the rated or cruising position; and one is only briefly concerned with all the other movable items in the cockpit. Unless, therefore, the view is bad, the seating position uncomfortable in relation to the controls, or the aircraft definitely unstable in one or more axes, the aileron control is the only thing which can be reasonably a cause for criticism of that vague and undescribed kind so often levelled by pilots who are not trained test pilots.

And I wonder whether, nowadays, designers and others are able to pay as much attention as they should to this vitally important item—whether, in fact, the incorporation of light and adequate aileron control is becoming a little beyond the capacity of designers now that speed ranges are so considerable. Probably it is. The problems are certainly immense, and difficulties are often met only by unsatisfactory compromises. The importance of the ailerons is still of high priority where "demonstrative" types are concerned—not so much because these controls are used more in fighter, medium bomber or "attack" aircraft, but because on their light and effective action over long periods depends the life of the pilot in war conditions—but there may be a tendency to "call it a day" where heavier aircraft are concerned and particularly where these are not designed for offensive work of any kind.

Presumably the day of the "straight" aileron, with nothing much more than an inset hinge-point to assist it, will soon be over. Speeds are so very high and speed-ranges so great, that upfloat, overbalance, or heaviness problems are too massive to be solved other than by the incorporation of servo devices of one kind or another. Unfortunately, servo systems are by no means without their troubles and tend to remove all trace of "feel." In theory, an aileron which has very much the same weight throughout the speed-range and throughout its own movement, and which shows no signs of overbalance at any speed, may be a good thing, but in practice it is far from being perfect. If it is light enough to be pelasant to use, then it can be most dangerous in the hands of a "ham" pilot, who will happily overstress the wing structure by violent control movements at high speeds; if it is heavy enough to be safe at high speeds, then it will be dull and puddingy at low or cruising speeds. It seems that it is difficult to arrange that a variation in weight with increased speed will be nicely proportionate with any conventional servo system, but I may be wrong about that.

All manner of different servo-tab systems will no doubt appear in an endeavour to provide perfect control in the lateral plane, and it may be that quite a simple system will be devised for use in light, medium and even really heavy aircraft. With increasing speeds there are no insuperable difficulties at present in providing reasonable lateral control in small and medium types, but the problems become quite acute when we are dealing with what can only be called "directly assisted" controls in large aircraft. Admittedly, the degree of "feel" and the dangers of over-stressing by over-lightening at high speeds are not important in these, since they are likely to be handled by experienced pilots and need not be flung about the sky at any time, but for happiness in the control department, "nice" ailerons are every bit as necessary in a hundred-tonner as they are in a first-line fighter.

Mechanical Automaticity

Some big aircraft in the past—and many which would not be considered "big" by modern standards—have been very hard work both for a human and the automatic pilot. Maybe the standard use of the latter will alter our ideas. Obviously this mechanical device will prefer the ailerons to be of much the same weight throughout the speed-range, and it may be that the entire control system of really large aircraft will eventually need to be based on the powers and reactions of the mechanical rather than of the human pilot. The advances made during this war in automatic control systems have been tremendous and will probably alter all our ideas of transport flying technique. When the whole of the flying, from the take-off to the landing, is done automatically, while an engineer looks after the works and a captain stands by only to direct the proceedings, then controls can be as puddingy and uninteresting as need be, and only the hydraulic jacks, servos and relays need to be considered.

In the meantime, it might be worthwhile to consider a combination of spoiler and aileron where human operation

CONTROL CONSIDERATIONS

is still the normal means of control. Full use of the spoiler has not yet been made in any production aircraft—and somewhere there may be the final answer.

I am of opinion that, just as the time is ripe for a new philosophy before any further real progress by the human race is possible, the moment is coming for a complete change in all our ideas of aerodynamic design—and moments usually produce the men. So the problems may solve themselves; any new conception will automatically result in a change of ideas through the entire aircraft. Even the few experiments which have been made with the tailless type of aircraft have caused some fairly startling alterations in control systems as they have been applied to the experiments in question. Monsieur Blèriot has had his day, and ailerons, elevators, rudders and the rest of it may soon go to join the conventional airframe in the science museums of the world. The whole thing, too, has been built round the internal-combustion reciprocating engine, and it begins to look as if this last will eventually be largely replaced by a more direct means of propulsion essentially suited to aircraft. And the new prime mover will need a very new kind of airframe. Development seems to have reached its peak along conventional lines and, even if there has to be a long period of comparative stagnation before the change-over, the moment and the man will arrive.

"INDICATOR."

New Year Honours

Further Awards to Service Personnel and Civilians

(*Continued from page* 13, *January 4th*, 1944)

ORDER OF THE BRITISH EMPIRE

C.B.E. (MILITARY DIVISION)

A.V-M. G. D. Daly, R.A.F.; A.V-M. G. E. Gibbs, R.A.F.; A.V-M. C. B. S. Spackman, R.A.F.; A.V-M. S. E. Toomer, R.A.F.; Air Comdres. D. A. Boyle, R.A.F.; H. F. Fuller, R.A.F.; C. E. N. Guest, R.A.F.; H. T. Lydford, R.A.F; F. J. W. Mellersh, R.A.F.; R. L. Ragg, R.A.F.; A. E. Sutton-Jones, R.A.F.; G. O. Venn, R.A.F.; F. M. F. West, V.C., R.A.F.; C. L. Archbold, R.A.F.; C. E. Chilton, R.A.F.; J. A. Easton, R.A.F.; H. J. Kirkpatrick, R.A.F.V.R.; A. H. Montgomery, R.A.F.; L. G. S. Payne, R.A.F.; G. A. Walker, R.A.F.; Grp. Capts. D. H. F. Barnett, R.A.F.O.; A. P. Besley, A.A.F.; P. F. Canning, R.A.F.; A. E. G. Collins, R.A.F.O.; W. J. Crisham, R.A.F.; R. Faville, R.A.F.; E. C. K. H. Foreman, R.A.F.; H. P. Fraser, R.A.F.O.; N. G. Goodman, R.A.F.; J. F. Hobler, R.A.F.; R. C. Mead, R.A.F.; H. W. Mermagen, R.A.F.; A. D. Messenger, R.A.F.; D. G. Morris, R.A.F.; H. W. Pearson-Rogers, R.A.F.; M. K. D. Porter, R.A.F.; F. C. Read, R.A.F.; C. Richdale, R.A.F.; J. F. Roulston, R.A.F.O.; N. C. S. Rutter, R.A.F.; Rev. A. McHardy, R.A.F.; D. de B. Clark, A.A.F.; J. N. Browne, A.A.F.; W. W. Deane, R.A.F.; A. H. Harrison, R.A.F.; H. H. Hilliar, R.A.F.; E. N. Lowe, R.A.F.; E. H. McDonald, R.A.F. (with effect from Nov. 13, 1944, since killed on duty); H. L. Maxwell, R.A.F.

O.B.E. (MILITARY DIVISION).

Air Comdre. R. L. Mills, R.A.F.; Air Comdre. A. H. Wheeler, R.A.F.; Grp. Capts. O. D. Allerton, R.A.F.; I. C. Bird, R.A.F.; E. G. M. Charleson, R.A.F.; J. B. Graham, R.A.F.; R. O. Jonas, R.A.F.; D. N. Kingston-Blair-Oliphant, R.A.F.; C. S. Moore, R.A.F.; W. R. Worstall, R.A.F.; S. G. Beaumont, A.A.F.; R. E. C. J. Beeny, R.A.F.; J. B. Black, R.A.F.; W. N. Cumming, R.A.F.O.; J. G. Davis, R.A.F.; G. R. Edge, A.A.F.; G. C. Eveleigh, R.A.F.; P. R. Foley, A.A.F.; R. A. Ford, R.A.F.V.R.; W. S. Gardner, R.A.F.; R. T. Gething, R.A.F.; J. C. M. Hay, R.A.F.; A. H. McM. Hely, R.A.F.; G. W. Houghton, R.A.F.V.R.; E. G. Jones, R.A.F.; G. M. Lindeman, R.A.F.O.; W. R. McBrien, R.C.A.F.; W. D. MacPherson, R.A.F.V.R.; A. D. Rose, R.A.F.V.R.; C. J. Salmon, R.A.F.; J. F. Sandow, M.R.C.S., L.R.C.P., R.A.F.; P. H. Smith, R.A.F.; L. A. Strange, R.A.F.; C. A. B. B. Wilcock, R.A.F.; Wing Cdrs. W. R. Beaman, R.A.F.; H. W. Berry, R.A.A.F.; R. H. Berryman, A.A.F.; E. J. Bradbury, R.A.F.; M. Brown, R.C.A.F.; W. W. Campbell, R.A.F.O.; F. H. Cashmore, R.A.F.; R. Cassels, R.A.F.; H. C. Daish, R.A.F.O.; P. H. Dorte, R.A.F.V.R.; W. E. Dunn, R.A.F.; A. Gollan, R.A.F.; G. Goodall, R.A.F.; E. J. Gribben, R.A.F.; A. G. Gullan, R.A.F.V.R.; P. E. Gwyer, R.A.F.; R. L. M. Hall, R.A.F.; K. L. B. Hodson, R.C.A.F.; P. H. Holmes, R.A.F.; J. H. Irvin, R.A.F.; R. W. Jackson, R.A.F.V.R.; R. K. Jeffries, R.A.F.; L. A. Jessop, R.A.F.V.R.; J. Lawson, R.A.F.; A. Levers, R.A.F.V.R.; W. J. Macken, R.A.F.; L. Maxwell-Muller, R.A.F.; C. I. Orr-Ewing, R.A.F.V.R.; G. J. E. Parsons, R.A.F.; R. J. P. Prichard, R.A.F.; J. G. Smithson, R.A.F.; A. J. M. Smyth, R.A.F.; L. W. Stotter, R.A.F.V.R.; J. H. Styles, R.A.F.; K. E. I. Wallace-Crabbe, R.A.F.V.R.; H. C. Witts, R.A.F.; L. T. Wright, R.A.F.; G. W. Adams, R.A.F.V.R.; B. Armiger, R.A.F.O.; P. E. Axon, R.A.F.V.R.; E. P. L. Baker, R.A.F.V.R.; W. H. Bentley, R.A.F.; F. E. W. Birchfield, R.A.F.O.; W. F. Blackadder, A.A.F.; J. A. Blanford, R.A.F.; S. P. A. Bousfield, R.A.F.V.R.; W. J. V. Branch, R.A.F.V.R.; R. E. C. Cadman, A.A.F.; C. F. M. Chapman, R.A.F. (with effect from November 28, 1944, since killed on duty); G. Clapperton, R.A.F.V.R.; P. C. Cleaver, R.A.F.V.R.; C. T. Davies, R.A.F.; E. A. Dennis, R.A.F.V.R.; P. C. W. Disney, R.A.F.O.; R. E. Drake, R.A.F.; D. Edwards, R.A.F.; T. H. E. Edwards, R.A.F.V.R.; R. W. B. Ellis, M.D., R.A.F.V.R.; C. E. St. J. Evers, R.A.F.V.R.; L. S. N. B. Faulkner, R.A.F.V.R.; J. Fearne, R.A.F.V.R.; S. J. Field, R.A.F.; J. W. Girling, R.A.F.V.R.; D. Gooderham, R.C.A.F.; P. Green, A.A.F.; T. J. M. Gregg, M.B., B.Chir., R.A.F.O.; P. L. Hancox, R.A.F.O.; E. A. Harrop, R.A.F.; R. M. Hayes, R.A.F.V.R.; G. W. Hignett, R.A.F.V.R.; R. I. H. Isdell-Carpenter, R.A.F.V.R.; D. A. Jackson, R.A.F.V.R.; F B. Jeffries, R.A.F.V.R.; W. E. F. Jennings, R.A.F.V.R.; G. Keighley, A.A.F.; D. N. Kendall, R.A.F.V.R.; C. W. Kidd, M.D., A.A.F.; J. I. Kilmartin, R.A.F.O.; W. F. Lamb, R.A.F.V.R.; J. W. Louw, R.A.F.O. N. McClelland, R.A.F.O.; D. L. McDonnell, R.A.F.V.R.; G. M. Macintosh, R.A.F.; T. F. Macrae, R.A.F.V.R.; G. R. Magill, R.A.F.O.; I. H. Mason, R.A.F.V.R.; D. V. G. Mawhood, R.A.F.O.; V. Mercer-Smith, R.A.F.V.R.; W G. Morgan, R.A.F.; J. E. T. Murphy, R.A.F.O.; the Duke of Newcastle, A.A.F.; A. C. W. Norman, A.A.F.; W. A. G. O'Brien, R.A.F.V.R.; J. S. Orme, R.A.F.V.R.; R. I. K. Owen, R.A.F.V.R.; J. L. Padmore, A.A.F.; R. D. Paul, R.A.F.V.R.; J. A. Payne, R.A.F.V.R.; S. J. Pursey, R.A.F.; N. G. L. Richards, R.A.F.V.R.; A. T. Richardson, R.A.F.V.R.; W. T. Richings, R.A.F.; R. L. Richmond, A.A.F.; F. J. Seabrook, R.A.F.; F. H. L. Searl, R.A.F.O.; W. J. R. Shepherd, R.A.F.V.R.; D. B. Smith, R.A.F.V.R.; J. L. Smith, M.R.C.S., A.A.F.; E. M. Sopwith, R.A.F.O.; R. C. T. Speir, R.A.F.V.R.; F. J. Stubberfield, R.A.F.; E. Sturman, R.A.F.V.R.; S. W. J. Tanner, R.A.F.V.R.; E. A. Taylor, R.A.F.V.R.; P.H. Thomson, R.A.F.V.R.; G. S. Waller, R.A.F.V.R.; V. H. Webb, R.A.F.; J. C. Wickham, R.A.F.; F. A. Wray, R.A.F.V.R.; Sqn. Ldrs. R. H. Brown, R.A.F.V.R.; Agnes Lilias Dovey, M.B., Ch.B., employed with R.A.F. Med. Branch; M. E. Faithfull, R.A.F.V.R.; A. Fisher, R.A.F.; T. C. Frampton, R.A.F.O.; J. C. Gilson, M.R.C.P., M.R.C.S., R.A.F.V.R.; G. D. L. Goslett, R.A.F.V.R.; G. W. Hodgkinson, R.A.F.V.R.; L. H. F. Irving, R.A.F.V.R.; A. Smith, R.A.F.; P. F. T. Wakeford, R.A.F.O.; The Rev. A. T. Clark, R.A.F.V.R.; the Rev. L. A. Sutherland, A.A.F.; Maj. J. R. Ryan, S.A.A.F.; Sqn. Ldrs. R. W. Baird, R.A.F.V.R.; J. E. Barber, R.A.F.; F.E Barnes, R.A.F.; C. P. Bennett, R.A.F.V.R.; J. W. Bennett, R.A.F.V.R.; D. P. Blatherwick, R.A.F.V.R.; P. C. Bullock, R.A.F.V.R.; G. H. Butler, R.A.F.V.R.; C. F. Clarke, R.A.F.V.R.; F. R. Cook, R.A.F.V.R.; W. G. Curtin, R.A.F.V.R.; C. W. A. Davies, R.A.F.; S. Deacon, R.A.F.; A. S. Duff, R.A.F.V.R.; K. J. B. Dunlop, R.A.F.; G. H. Duthie, M.B., Ch.B., A.A.F.; J. D. Ford, R.A.F.O.; R. G. Foskett, R.A.A.F.; E. E. L. Giuseppi, R.A.F.V.R.; R. Godwin, R.A.F.;

NEW YEAR HONOURS

J. G. E. Home, R.A.F.V.R.; J. V. M. Howe, R.A.F.V.R.; J. McA. Hutcheon, R.A.F.V.R.; A. E. Jaquemet, R.A.F.V.R.; L. F. Johnson, R.A.F.V.R.; E. W. Joseph, R.A.F.V.R.; A. W. G. Le Hardy, R.A.F.V.R.; G. J. Lloyd, R.A.F.; C. W. T. MacGillivray, R.A.F.V.R.; S. J. Madill, R.N.Z.A.F.; S. M. Martin, R.A.F.V.R.; J. D. Marvin, R.A.F.V.R.; D. Maskell, R.A.F.V.R.; R. S. Neil, R.A.F.; S. R. Newton, R.A.F.; F. E. North, R.A.F.V.R.; P. J. O'Connor, R.A.F.V.R.; B. G. Parsons-Smith, M.R.C.P., M.R.C.S., R.A.F.V.R.; A. H. Porter, R.A.F.; C. Price, R.A.F.V.R.; T. D. Ross, R.A.F.V.R.; R. E. Skelley, R.A.F.V.R.; R. H. Steel, R.A.F.; G. H. Tripp, R.A.F.V.R.; M. S. Turpin, A.A.F.; L. H. S. A. G. Warren, R.A.F.V.R.; C. Wise, R.A.F.V.R.; Grp. Officer C. M. McAlery, W.A.A.F.; Sq./O. A. W. P. Bruzaud, W.A.A.F.; Sq./O. D. M. Barton, W.A.A.F.; Sq./O. M. W. W. Ford, W.A.A.F.; Sq./O. M. Hibbert, W.A.A.F.; Sq./O. M. McManus, W.A.A.F.

BAR TO AIR FORCE CROSS.

Sqn. Ldr. A. H. Humphrey, R.A.F.; W/O. A. G. W. Gold, R.A.F.

AIR FORCE CROSS.

Grp. Capts. R. A. C. Barclay, R.A.F.; F. R. Carey, R.A..F; Wing Cdrs. R. S. Blake, R.A.F.; R. W. Denison, R.A.F.O.; W. W. Loxton, R.A.F.; R. F. D. Anstead, R.A.F.O.; P. A. R. Bremridge, R.A.F.O.; E. D. Crundall, R.A.F.O.; D. B. Harris, R.A.F.O.; D. C. McKinley, R.A.F.O.; J. N. Ogle, R.A.F.; J. D. N. Sidebottom, R.A.F.V.R.; Sqn. Ldrs. E. N. Harris, A.A.F.; R. T. Langton, R.A.F.; E. P. Lash, R.A.F.V.R.; H. A. Marsh, R.A.F.O.; H. J. D. Matson, R.A.F.O.; E. F. Rhodes, R.A.F.V.R.; B. S. Smallman, R.A.F.O.; R. G. Wilberforce, R.A.F.V.R.; G. P. Wildish, R.A.F.O.; J. M. B. Beard, R.A.F.V.R.; J. F. Brookes, R.A.F.V.R.; D. J. B. Cross, R.A.F.; S. Davidson, R.A.F.V.R.; A. B. R. Dow, R.A.F.V.R.; J. M. O. Dyer, R.A.F.; D. S. Edwards, R.A.F.V.R., with effect from October 19th, 1944 (since deceased); W. P. Ferrie, R.A.F.V.R.; E. A. G. Goldie, R.A.F.V.R.; D. G. Hewlings, R.A.F.V.R.; W. A. L. Johnson, R.A.F.; G. Kennedy, R.A.F.; G. P. Lace, R.A.F.V.R.; F. Landrey, R.A.F.; J. H. Lowes, R.A.F.; K. J. Plested, R.A.F.; A. Round, R.A.F.V.R.; E. A. Shipman, R.A.F.; J. S. Tannahill, R.A.F.V.R.; R. O. Trapp, R.A.F.V.R.; R. C. H. Withers, R.A.F.V.R.; G. H. Wright, R.A.F.V.R.; Flt. Lts. A. Allan, R.A.F.V.R.; T. E. O. Andrews, R.A.F.V.R.; E. W. Aries, R.A.F.V.R.; D. W. Attwood, R.A.F.V.R.; L. V. Bachellier, R.A.F.; W. D. Beddow, R.A.F.; E. D. A. Bigg, R.A.F.V.R.; E. H. G. Brookes, R.A.F.V.R.; K. E. Bryceson, R.A.F.V.R.; R. A. Carr-Lewty, R.A.F.; R. W. H. Carter, R.A.F.O.; E. F. W. Clarkson, R.A.F.; C. G. Dennis, R.A.F.V.R.; E. S. Draper, R.A.F.V.R.; E. J. Fleet, R.A.F.; P. A. P. Gay, R.A.F.V.R.; R. D. Gerrans, R.A.F.V.R.; N. A. Gillham, R.A.F.V.R.; W. B. Henn, R.A.F.V.R.; A. Hindley, R.A.F.O.; J. K. Horsburgh, R.A.F.V.R.; C. F. Hughesdon, R.A.F.O.; R. J. Hyde, R.A.F.V.R.; G. W. Ibbs, R.A.F.V.R.; B. S. L. Johnston, R.A.F.V.R.; M. A. Lacayo, R.A.F.V.R.; J. E. L. Larsen, R.A.F.V.R.; J. B. Linton, R.A.F.V.R.; P. Mace, R.A.F.V.R.; S. F. Mackie, R.A.F.V.R.; J. K. Norwell, R.A.F.V.R.; C. L. Pashley, R.A.F.V.R.; E. J. Saunders, R.A.F.V.R.; D. A. Savage, R.A.F.V.R.; J. W. J. Saward, R.A.F.V.R.; L. G. Turner, R.A.F.V.R.; A. L. Walker, R.A.F.V.R.; B. A. Walker, R.A.F.V.R.; W. D. Webster, R.A.F.V.R.; T. M. Welch, R.A.F.V.R.; L. Williams, R.A.F.V.R.; R. L. G. Worthy, R.A.F.V.R.; F. H. J. Ashley, R.A.F.V.R.; R. S. de V. Le Masurier, R.A.F.V.R. (awarded with effect from October 18, 1944 (since deceased)); H. Murphy, R.A.F.V.R.; E. C. L. Nichols, R.A.F.V.R.; T. Oakes, R.A.F.V.R.; R. H. Robson, R.A.F.V.R.; F/O.s W. L. Adams, R.A.F.V.R.; I. K. Arber, R.A.F.V.R.; J. S. Brindle, R.A.F.V.R.; A. J. Cruickshank, R.A.F.V.R.; D. W. H. Davies, R.A.F.V.R.; A. E. Fletcher, R.A.F.V.R.; D. J. Herbert, R.A.F.V.R.; T. W. Howard, R.A.F.V.R.; E. G. R. Morgan, R.A.F.V.R.; A. Reeks, R.A.F.; E. Thompson, R.A.F.V.R.; P/Os. R. E. C. Altounyan, R.A.F.V.R.; F. A. Barker, R.A.F.V.R.; V. G. Daw, R.A.F.O.; R. F. Harman, R.A.F.O.; L. G. Lemay, R.A.F.V.R.; R. J. F. Mansell, R.A.F.V.R.; W/Os. F. R. Adams, R.A.F.V.R.; J. de Little, R.A.F.V.R.; J. M. McCallum, R.A.F.V.R.; J. Martin, R.A.F.; R. Shaw, R.A.F.; W. T. C. Symmons, R.A.F.; E. F. Wild, R.A.F.V.R.; A. G. Zealand, R.A.F.V.R.

AIR FORCE MEDAL

Flt. Sgts. D. T. Butcher, R.A.F.V.R.; B. J. Kenny, R.A.F.; E. E. Lambden, R.A.F.V.R.; S. H. Lewthwaite, R.A.F.V.R.; D. Little, R.A.F.; A. Martin, R.A.F.V.R.; R. E. Palmer, R.A.F.V.R.; P. C. Wright, R.A.F.V.R.; Sgt. W. H. C. Gulliver, R.A.F.; Cpl. L. H. Pitt, R.A.F.V.R.; L.A/Cs. W. F. Brodie, R.A.F.V.R.; L. J. Varney, R.A.F.V.R.

ROYAL NAVY
AIR FORCE CROSS

Cdr. F. M. A. Torrens-Spence.

ROYAL AUSTRALIAN AIR FORCE
AIR FORCE CROSS

Sqn. Ldr. J. D. Beckingsale; Flt. Lts. M. M. Midgley; C. B. Smith; F. G. Cracknell; F/O.s G. M. Ball; A. F. Easey; D. C. Forman; H. M. Hackworthy; I. W. B. Lindley; P. R. Vickery.

ROYAL CANADIAN AIR FORCE
AIR FORCE CROSS

Flt. Lts. E. G. Cork; F. Hastings; R. M. Smith; H. S. Lewis; F/O. L. B. Wyman.

ROYAL NEW ZEALAND AIR FORCE
AIR FORCE CROSS

Flt. Lts. D. M. Mackenzie; C. H. Fox; J. F. Taylor; W/O.s G. Francis; L. C. Sadler.

SOUTH AFRICAN AIR FORCE
AIR FORCE CROSS

Majs. C. S. Kearey; B. T. Smith; Capts. S. J. Love; C. J. Stark.

AIR FORCE MEDAL

Flt. Sgt. S. Hancock.

BURMA VOLUNTEER AIR FORCE
AIR FORCE CROSS

Flt. Lt. E. Isaacs.

PRINCESS MARY'S R.A.F. NURSING SERVICE
MEMBERS ROYAL RED CROSS

Matrons Miss M. A. MacVicar, A.R.R.C.; Miss H. Adams, A.R.R.C.; Miss M. E. Garnett, A.R.R.C.; F/O. D. I. Mulholland, R.C.A.F.N.S.

ASSOCIATES ROYAL RED CROSS

Matron Miss V. M. Minchin; Senior Sisters Miss M. F. L. Barley, Miss M. E. Grieveson; Miss D. M. Leachman; Miss M. McDowell; Miss E. Stewart; Sisters Miss M. T. Kelly; Miss M. Smart; Miss N. H. Thomas; Miss B. A. Twining.

SECOND LIST

ORDER OF THE BRITISH EMPIRE
O.B.E. (CIVIL DIVISION)

H. Bell, Educational Adviser to A.T.C. Committee, Scotland; N. Blond, Temporary Assistant Secretary, Ministry of Production; Capt. P. J. Dawson, Principal Technical Officer, Directorate of Armament Development, Ministry of Aircraft Production; H. A. Denne, Deputy Controller, Ford Motor Co., Ltd. (Aero Engines); Observer Capt. A. P. Hamilton, Comdt., S. Area, R.O.C.; B. Haviland, Works Controller, S. Smith and Sons (England), Ltd.; G. C. King, Assistant Director of Accounts, Air Ministry; Cdr. L. M. Leaver, A.T.A.; Sqn. Ldr. V. S. Erskine-Lindop, R.A.F. (Retd.), Senior Joint Secretary, R.A.F. Benevolent Fund; H. E. Moore, M.B., Ch.B., Civilian Adviser on Rehabilitation, Air Ministry; Ald. O. G. F. Morris, Chairman, A.T.C. Committee, Wandsworth Wing; T. L. Nuttall, Works Manager, Ford Motor Co., Ltd.; Capt. H. H. Perry, Senior Capt. of Aircraft, B.O.A.C.; B. A. Smith, Principal Education Officer, R.A.F. Educational Service; H. D. Strawson, Chief Maintenance Engineer, B.O.A.C.; Maj. I. C. Vincent, Member Newport (Mon.) A.T.C. Committee; Capt. J. A. V. Watson, Chief Test Pilot, A.T.A.; F. C. Williams, D.Phil., D.Sc., Principal Scientific Officer, Telecommunication Research Establishment, Ministry of Aircraft Production.

Capt. H. H. Perry. B.O.A.C.—O.B.E.

W. Humble. Hawker Test Pilot. — M.B.E.

M.B.E.

A. B. Hatton, Technical Manager, Dunlop Balloon Factory; W. Humble, Development Test Pilot, Hawker Aircraft, Ltd.; W. A. Robinson, Chief Inspector, Handley Page, Ltd.

* * *

The Honours List includes also a very large number of members of the Forces mentioned in despatches or commended.

CORRESPONDENCE

The Editor does no' hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases accompany letters.

AIR CARGO TRANSPORT
No Fortune to be Made

THE letter by Mr. Nigel Walker in your issue of December 7th, 1944, is of great interest since, with the minimum of information available, he seems to decide that there is much money to be made in air cargo transport by using an aircraft like the Bristol "Freighter." At the last moment, however, he seems to lose confidence and thinks that there must be a catch in it somewhere.

I am not competent to judge Mr. Walker's analysis of aircraft and operating costs, but from such knowledge as I possess, after some years of slight association with British air transport, I ask him and your readers a few questions which may serve either to dissipate or confirm his views.

Mr. Walker bases his deductions on between 2,000 hr. and 3,000 hr. flying per annum. Is this too optimistic? I believe B.O.A.C. are well satisfied with about 1,500 hr. with their "C" class flying boats; on the other hand, I seem to have seen references to American airlines getting 4,500 hr. Obviously the vital factor is utilisation, especially when one considers that difference of revenue between 1,500 hr. and 4,500 hr. amounting to £90,000.

Next, I do not understand Mr. Walker's reference to engines. Surely he does not intend to purchase new engines every 500 hr.? Further, why does he hope to defray the initial cost of the aircraft in the first year? It would seem to me that to write off the airframe progressively in five years and the engine after 7,000 hr. would be sufficiently conservative.

On the whole, therefore, Mr. Walker fails to convince certainly one of your readers that anything like a fortune is to be made out of cargo transport. But then he does not convince himself. BRIAN MACARTNEY-FILGATE.

ORGANISING FOR EFFICIENCY
Reliability, Costs and Cruising Speed

SURELY "Indicator's" article in your issue of December 7th should be called "Organising for Inefficiency."

If this is his idea of the civil airliner, then certainly we must get a new conception of the requirements for civil aviation and get rid of the complexity of the military aircraft. If we cannot design aircraft that, complete with all the "hotch-potch of mechanical contrivances," will give 100 per cent. reliability without attention for 60-80 hours, then we might as well give up competing in this market.

"Indicator" proposed that the base for, say, the England-Australia route should be in India. Now, if 500 engineers are required to maintain the aircraft, has he considered the problems of employing 500 men overseas continuously, getting all equipment to them, arranging for long leave periods, the difficulty that India might object to the employment of these men and insist that a certain percentage be Indians, and so forth? The difficulties involved in setting up large depots overseas are immense. And he has achieved nothing, because these 500 men could be stationed as follows: 350 in England and 150 in Australia. The distance a party would have to travel to rescue a stranded aircraft would be the same. Is it not true that the distance from India to England is no less than the distance from England to India?

What we want is aircraft which can operate this route with 100 per cent. reliability, without inter-stage maintenance. In the beginning, "caches" along the route would probably be advisable, but no piece of equipment should take longer than an hour to change.

While on this question of civil aviation I would like to ask Mr. Pollitt ("A Civil Power Plant," December 7th) three questions:—

1. Does he realise that the most dangerous period in flying is when the aircraft has just become airborne and has its undercarriage and flaps down? Ten seconds should be the absolute maximum time for undercarriage retraction.
2. Does he believe that designers put the airscrew so far forward of the leading edge just for convenience? If he extends the reduction gear casing he is almost back where he started.
3. Why must an engine change be made in 15 minutes? It takes longer than this to refuel an aircraft, and I doubt if any real economy is shown by reducing the time to less than an hour.

It would seem that all the advantages he claims could be more easily attained by removing all auxiliary drives from the engine and using an auxiliary power-unit for this purpose.

Mr. Nigel Walker ("The Bristol Freighter," December 7th) made his most accurate statement in his last line: "But then my figures must be wrong, or it would be too easy."

His figures for the revenue to be earned by the Bristol Freighter are calculated on 100 per cent. pay-load being carried at all times. An operator would be grateful if he could be guaranteed 60 per cent. This reduces the revenue to £36,000 from £54,000. Secondly, operating over short distances, it would be almost impossible to average more than 2,500 hours a year, since so much time would be spent on the ground in loading and unloading. I am not quite sure how he arrives at the initial cost of £1 per gross lb., or why he requires twelve engines, but on these figures he has lost £15,000 per year per aircraft before he has started to pay for crews, administrative staff, landing fees, etc.

However, I think the main point regarding the Bristol Freighter has been missed. It is useless to design an aircraft with a cruising speed of 130 m.p.h., as it simply cannot cope against strong head winds. COLIN C. RICHARDSON.

IMPLICATIONS OF V.2
Centrifugal Force Not Involved

I AM sorry that Mr. Spearman did not get the point of my letter concerning V.2. Perhaps these added comments will serve to convince.

The final velocity V of a rocket is given by the relation

$$V = v \log_e R$$

where v is the exhaust velocity, and R is the ratio of original mass to final mass; v is of the order of 3 km/sec. for liquid propellant, and an R of 7 was taken for my calculations (14 tons at take-off—dead mass, plus load 2 tons). These give a final velocity of 3 log 7, or 6 km./sec. Air resistance and the gravitational loss due to finite acceleration might reduce this to 5 km/sec. (3 m.p.s.), but the former force would only be operative for a short time.

We now have our payload—a one-ton rocket—travelling at 5 km/sec. For it to escape from the earth it must reach the parabolic velocity, which is 11.2 km/sec. (7 m.p.s.). It must, therefore, be capable of increasing its speed by 6.2 km/sec., and this implies an R of 8. In practice, this might have to be increased to 10 to overcome gravitational losses. These could be quite small as the rocket could use a much higher acceleration than the earlier component; there would, of course, be no air resistance.

Assuming, therefore, that it is possible to construct a smaller component of mass 2,000 lb., and R of 10 (i.e., final mass of 200 lb.), it would be possible to get a payload of something less than 100 lb. to the moon. It would, of course, crash at about 2 km./sec., but this would not matter if automatically transmitting instruments are used

These figures are, of course, approximate, and it might be necessary to increase the overall mass to 20-30 tons, but the order of magnitude is correct.

Mr. Spearman is quite wrong in thinking that the velocity of escape (7, not 7½ m.p.s.) has anything to do with centrifugal force. It only refers to a body leaving the earth vertically. Probably he is thinking of the *orbital*, or circular velocity, which is only 5 m.p.s. A rocket which reached this speed outside the atmosphere in horizontal flight would circle the earth for ever. This is a much easier proposition than the vertical escape, and for many scientific purposes would be a good deal more useful.

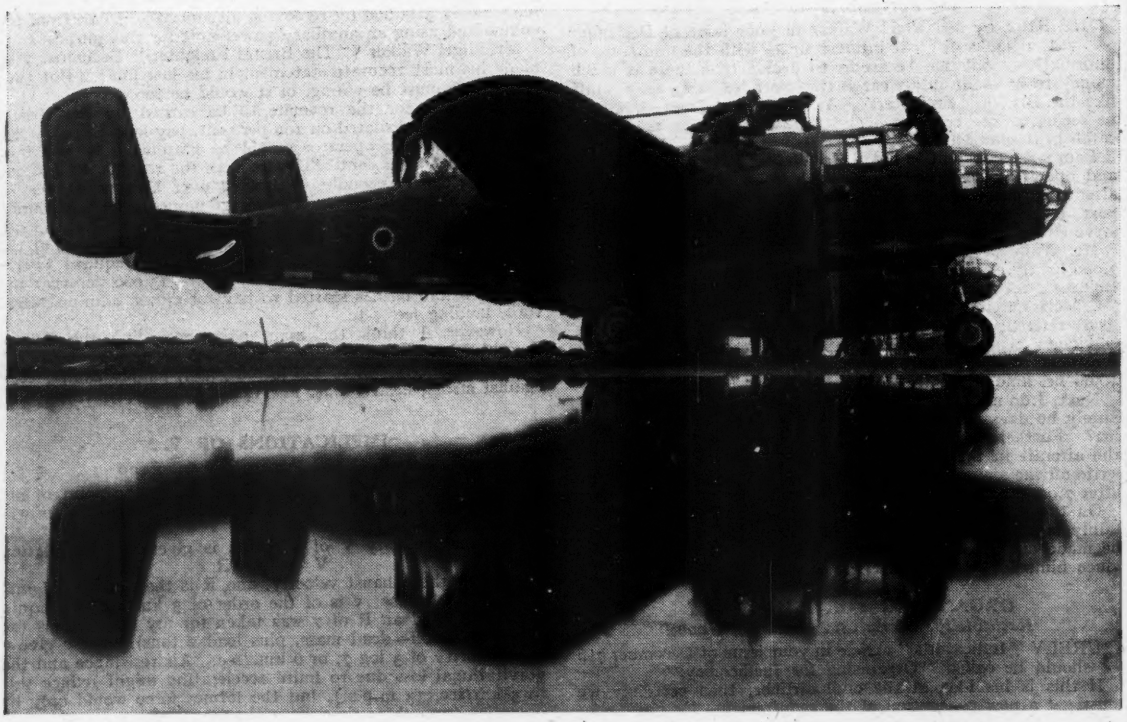
Finally, I would like to correct the widespread fallacy that a rocket must travel at so high an acceleration that it would kill the occupants. A rocket would *not* exceed 3g in the atmosphere, and V.2 does only 1g. A well-protected man in good health can endure 6g for prolonged periods, as centrifugal tests have shown. Special suits and drugs would probably increase this figure, but it is very unlikely that rockets would ever be employed at more than about 5g. Stressing problems become so considerable that it is almost true to say that the limit is set by the machine before it is reached by the man.

K. W. GATLAND.

For the Combined British Astronautical Societies, and the British Interplanetary Society Nuclear Committee.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements



Ground crews swarm over an R.A.F. Mitchell, clearly reflected in a pool on its waterlogged airfield.

Promotions

TECHNICAL BRANCH.

Air Comdre. C. B. COOKE C.B.E., is granted the acting rank of Air Vice-Marshal. Dec. 6th, 1944.

MEDICAL BRANCH.

Air Comdre. (temp. Air Vice-Marshal) A. GRANT, C.B.E., M.B., Ch.B., D.P.H., K.H.S., to Air Vice-Marshal. Dec. 1st, 1944.

Group Capt. (temp. Air Comdre.) (act. Air Vice-Marshal) T. J. KELLY, M.C., M.D., Ch.B., to Air Comdre. Dec. 1st, 1944.

Group Capt. (temp. Air Comdre.) K. BIGGS, M.C., M.R.C.S., L.R.C.P., D.P.H., to Air Comdre. Dec. 1st, 1944.

Group Capt. (temp. Air Comdre.) (act. Air Vice-Marshal) A. F. ROOK, O.B.E., F.R.C.P., M.R.C.S., D.P.H., K.H.P., to Air Vice-Marshal (temp.). Jan. 1st, 1945.

Retirement

GENERAL DUTIES BRANCH.

Group Capt. (temp. Air Comdre.) C. H. NICHOLAS, D.F.C., A.F.C., retaining the rank of Air Comdre. Nov. 12th, 1944.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Wing Cdr. R. J. GOSNELL, D.F.C., R.A.F., No. 571 Sqn.

Act. Sqn. Ldr. W. C. BRODIE, D.F.M., R.A.F., No. 692 Sqn

Act. Sqn. Ldr E. J. GREENLEAF, R.A.F., No. 571 Sqn.

One night in October, 1944, a force of bombers was detailed for an important low-level mining mission, an operation requiring considerable skill and accuracy in flying. The target was strongly defended by heavy and light anti-aircraft guns, searchlights and balloons. Undeterred by these hazards and the most adverse weather, the operation was completed successfully. The success achieved reflects the greatest credit on the personnel mentioned.

Act. Wing Cdr. C. M. MILLER, D.F.C., R.A.F.V.R., No. 85 Sqn.—During a long and varied operational career this officer has consistently displayed exceptional leadership and skill in both offensive and defensive operations. Recently, in offensive operations, the squadron has destroyed at least 13 enemy aircraft and damaged others without loss to themselves. The success achieved is mainly due to this officer's careful planning and personal example.

Act. Group Capt. H. J. CUNDALL, D.F.C., A.F.C., R.A.F., No. 105 Sqn.—This officer has participated in a large number of sorties since being awarded the D.F.C., and throughout he has displayed a high standard of bravery and devotion to duty. Group Capt. Cundall's squadron has executed many sorties recently, and much of the success achieved can be attributed to this officer's careful planning, great skill and unbeatable determination.

Act. Wing Cdr. A. F. AVANT, D.F.C., R.C.A.F., No. 427 (R.C.A.F.) Sqn.—This officer has completed numerous sorties on his second tour of operational duty. He is a highly skilled and fearless squadron commander, whose gallant leadership has been well reflected in the fighting qualities of the squadron. His devotion to duty over a long period has been unfailing.

Wing Cdr. J. F. GREY, D.F.C., R.A.F., No. 207 Sqn.—This officer has, by his gallant example, inspired and maintained a high degree of confidence amongst his aircrews. On ten occasions his aircraft has been engaged by enemy fighters, seven of which were shot down in the ensuing fights. The successes obtained are a fine tribute to Wing Cdr. Grey's great skill and leadership in action. This officer has commanded the squadron with great success.

Act. Sqn. Ldr. L. A. DWEN, R.A.F.V.R., No. 156 Sqn.—This officer is a fearless and skilful captain of aircraft. He has completed a large number of sorties, many of them against dangerous and difficult targets. He has invariably pressed home his attacks with great skill and resolution, qualities which have brought him much success. He is a fine captain of aircraft whose devotion to duty has been untiring.

Act. Sqn. Ldr. R. F. GRIFFIN, D.F.C., R.A.F., No. 156 Sqn.—This officer has displayed the highest standard of skill, courage and devotion to duty in air operations. As observer he completed a very large number of sorties before joining his present squadron. Since then, Sqn. Ldr. Griffin has completed many more sorties in the capacity of pilot and captain and has attacked a variety of targets with success. A fearless and determined captain of aircraft, Sqn Ldr. Griffin has set an example of the highest order.

Act. Sqn. Ldr. J. N. ROWLAND, D.F.C., R.A.F., No. 625 Sqn.—This officer has displayed great keenness, skill and courage in his capacity as captain of aircraft. Since being awarded the D.F.C. Sqn. Ldr. Rowland has participated in numerous sorties, involving attacks on a wide range of targets important to the enemy's war effort. He has invariably pressed home his attacks with the greatest determination and his successes have been well proven by the photographs secured. In addition to his fine work in the air, this officer has rendered valuable service in the training of other members of the squadron.

Act. Sqn. Ldr. H. A. SCOTT, D.F.C., R.A.F., No. 109 Sqn.—This officer has participated in well over one hundred operational missions against the enemy. He is an observer of the highest standard, and his brilliant work has been an important factor in the success of many operations. He has displayed outstanding coolness and courage in the face of the heaviest opposition, and his example has inspired all. His record is outstanding.

Act Sqn. Ldr. S. SLATER, D.F.C., R.A.F.V.R., No. 576 Sqn.—Since being awarded the D.F.C. this officer has participated in very many sorties, including attacks on such targets as Berlin, Frankfurt, Stuttgart and Kiel. He has continued to display the highest standard of skill and bravery and has set a fine example to all. He has commanded his flight with much success and his untiring efforts, strong sense of discipline and fine fighting qualities have contributed in good measure to operational efficiency of the formation.

Act. Sqn. Ldr. J. C. THELWELL, D.F.C., R.A.F.V.R., No. 109 Sqn. Sqn. Ldr Thelwell has completed more than 100 sorties. In the course of his assignments he has attacked a wide range of important and well-defended targets, and his successes are an excellent testimony to his great skill, courage and tenacity. He has rendered much devoted and loyal service.

Act. Sqn. Ldr D. J. WILSON, D.F.C. R.A.F.V.R., No. 617 Sqn.—This officer has taken part in numerous missions over enemy territory, including attacks on Berlin, Hamburg, Bremen, Cologne and Mannheim. He is now on his third tour and has completed many sorties demanding

SERVICE AVIATION

a high standard of skill and accuracy. He has proved himself to be an ideal leader and his example has been most inspiring.

Second Bar to Distinguished Flying Cross

Flt. Lt. T. BALLAUFF, D.F.C., A.F.C., R.A.F.V.R., No. 139 Sqn.—Since being awarded the D.F.C. this officer has taken part in further operational sorties and has completed a second tour of operational duty. On several occasions his aircraft has been damaged by fire from the enemy defences. Flt. Lt. Ballauff is an outstanding pilot who can always be relied on to press home his attacks with the utmost courage and determination.

Bar to Distinguished Flying Cross

Act. Flt. Lt. K. R. TRIGGS, D.F.C., R.A.F.V.R., No. 692 Sqn.—For citation see Wing Cdr. GOSNELL, D.S.O., D.F.C.

Act. Wing Cdr. H. W. CONNOLLY, D.F.C., R.A.A.F., No. 466 (R.A.A.F.) Sqn.—Since being awarded the Distinguished Flying Cross this officer has continued to display high courage and devotion to duty. In July, 1944, he was detailed to lead a formation of aircraft in an attack on a flying bomb site. On approaching the target intense and accurate fire was encountered and, although his aircraft sustained severe damage, Wing Cdr. Connolly flew a straight course and bombed his objective accurately. His high courage and determination on this occasion contributed much to the success achieved in the attack.

Flt. Lt. R. F. C. GARVEY, D.F.C., R.A.F., No. 541 Sqn.—This officer has completed numerous reconnaissance sorties, setting an example of great courage and devotion to duty. In October, 1944, he was detailed to obtain photographs of a certain objective. After completing his photographic runs Flt. Lt. Garvey noticed two enemy fighters behind him. Their leader opened fire. Flt. Lt. Garvey spiralled almost to ground level, pulling out of his dive at the last moment. His attacker, who had followed him down, dived into a wood and burst into flames. This incident is characteristic of the skill and determination consistently displayed by this officer.

Wing Cdr. N. J. STARR, D.F.C., R.A.F.O., No. 605 Sqn.—Since the award of the D.F.C. Wing Cdr. Starr has flown on numerous operational sorties and has destroyed one flying bomb over the sea. In July, 1944, during an air combat he destroyed one enemy aircraft, bringing his victories to at least two enemy aircraft destroyed in the air and two on the ground. An excellent squadron commander, he has a distinguished record of operational flying. During the period of his command the squadron has destroyed at least 18 enemy aircraft while over enemy territory and damaged many others. In addition, they have destroyed 68 flying bombs, by night.

Act. Sqn. Ldr. R. I. A. SMITH, D.F.C., R.C.A.F., No. 401 (R.C.A.F.) Sqn.—Since being awarded the D.F.C., Sqn. Ldr. Smith has completed numerous sorties against the enemy. In four days he achieved the remarkable feat of destroying seven enemy aircraft. As Squadron Commander this officer led 412 Squadron on six missions in three days during which period it destroyed 27 enemy aircraft and damaged nine others. This was accomplished during the enemy's persistent efforts to destroy bridges in the Arnhem and Nijmegen area which were vital to our ground forces.

Flt. Lt. G. W. JOHNSON, D.F.C., R.C.A.F. No. 401 (R.C.A.F.) Sqn.—Since being awarded the D.F.C. Flt. Lt. Johnson has continued his attacks against the enemy with great success. On two recent occasions while he was leading his squadron large formations of enemy aircraft were engaged. Owing to his fine leadership five enemy aircraft were destroyed and two were damaged. Flt. Lt. Johnson has destroyed three and damaged one enemy aircraft. In addition he has destroyed a large number of enemy mechanical transport vehicles, often in the face of intense anti-aircraft fire. Flt. Lt. Johnson continues to display outstanding courage and coolness in the face of danger.

Flt. Lt. D. C. LAUBMAN, D.F.C., R.C.A.F., No. 412 (R.C.A.F.) Sqn.—Since being awarded the D.F.C. Flt. Lt. Laubman has completed many sorties against the enemy. He continues to show tenacity of spirit and outstanding courage in the face of overwhelming odds. Flt. Lt. Laubman has led his flight with such ability that they have accounted for 16 out of 26 enemy aircraft destroyed by his squadron, and he was responsible for the destruction of eight and the damaging of two in three days, bringing his total to thirteen enemy aircraft destroyed and two damaged. This officer's squadron was outnumbered by the enemy on all three occasions, but with undaunted courage and determination they successfully broke up repeated enemy attempts to destroy bridges vital to our ground forces in the Arnhem and Nijmegen area.

Act. Sqn. Ldr. M. J. GRAY, D.F.C., R.A.F.V.R., No. 2 Sqn.—This officer has displayed outstanding ability and zeal. He is a gallant and forceful leader, whose personal example has contributed materially to the high standard of efficiency of the squadron which has obtained much success. He has commanded the squadron for some months, during which period the formation has completed many sorties, involving reconnaissances and attacks on radio buildings and flying bomb sites. Sqn. Ldr. Gray has taken part in many of these assignments.

Act. Flt. Lt. C. P. MCDONALD, D.F.C., D.F.M., R.C.A.F., No. 83 Sqn.—Flt. Lt. McDonald is a very experienced captain of aircraft who has consistently maintained a high standard of skill, resolution and tireless devotion to duty. He has completed numerous sorties which have included attacks on many important targets. Despite setbacks, he has continued to show undiminished keenness to operate and coolness and courage in the air which are worthy of the highest praise. In April, 1944, he was shot down into the sea, but rejoined his squadron, and on his first sortie was forced to abandon his aircraft by parachute, when he sustained a broken ankle. Again he rejoined his squadron. In May, 1944, he participated in an attack on a target in France. Flt. Lt. McDonald circled the target at a very low altitude in the face of persistent fighter opposition. He displayed superb airmanship in controlling his aircraft despite the intense blast effect of many exploding bombs.

F/O. R. G. PRIDDAY, D.F.C., R.C.A.F., No. 429 (R.C.A.F.) Sqn.—F/O. Pridday is an excellent flight engineer. Since the award of the D.F.C., he completed a second tour of operations, during which he has completed many attacks on heavily defended targets in Germany. On several occasions his skill and resource have largely contributed to the prevention of attacks by enemy night fighters. At all times he has displayed qualities of courage and determination of a very high order.

Sqn. Ldr. W. A. CHRISTENSEN, D.F.C., R.A.A.F., No. 105 Sqn.—Since the award of the D.F.C., Sqn. Ldr Christensen has participated in many operational missions. This officer's exemplary courage and cool initiative in the most hazardous circumstances, combined with his efficiency and devotion to duty, merit the highest praise.

Act. Sqn. Ldr. H. J. BARKER, D.F.C., R.A.A.F., No. 139 Sqn.—Sqn. Ldr. Barker is an outstanding navigator who has always shown the utmost keenness to operate against the enemy. He has participated in many sorties over a wide range of targets, including fifteen missions to Berlin. His enthusiasm, skill and devotion to duty have been most praiseworthy.

Act. Sqn. Ldr. D. C. DIXON, D.F.C., R.A.A.F., No. 105 Sqn.—Since the award of the D.F.C., this officer has taken part in many more operational sorties He has continued to display outstanding courage, ability and tenacity of purpose.

Act. Sqn. Ldr. L. C. JACOBE, D.F.C., R.A.A.F., No. 109 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Jacobe continued to show outstanding skill as a pilot. He has completed two tours of operational duty, during which he has participated in attacks on many of the most difficult and heavily defended targets in Germany. His keenness, reliability and devotion to duty have been most praiseworthy.

Act. Sqn. Ldr. R. C. WISEMAN, D.F.C., R.A.A.F., No. 156 Sqn.—This officer has completed numerous sorties against a wide variety of targets. Since the award of the D.F.C., he has continued to maintain a high standard of leadership, outstanding determination and admirable airmanship, both as an operational pilot and captain of aircraft.

Flt. Lt. C. W. J. FALKINDER, D.F.C., R.A.A.F., No. 109 Sqn.—Flt. Lt. Falkinder has completed numerous sorties both in heavy bombers and Mosquito aircraft against a wide variety of targets. He has proved himself a navigator of great skill, efficiency and devotion to duty.

Act. Wing Cdr. S. BAKER, D.S.O., D.F.C., R.A.F.V.R., No. 7 Sqn.—Wing Cdr. Baker is on his third operational tour. He has completed a large number of sorties and has operated many times against some of the most heavily defended targets. His outstanding ability has always inspired the utmost confidence of his crew. Since the award of the D.S.O. he has continued to display a fine fighting spirit, cool courage and a firm determination to press home his attacks, despite any opposition, which are worthy of high praise.

Act. Wing Cdr. B. H. D. FOSTER, D.S.O., D.F.C., R.A.F.V.R., No. 7 Sqn.—This officer has a splendid record of operational flying. He has proved himself an outstanding captain and flight commander. Wing Cdr. Foster's skilful handling of his aircraft under hazardous circumstances, together with his determination to press home his attacks despite strong opposition, has set a magnificent example to all members of his squadron.

Sqn. Ldr. P. G. SOOBY, D.F.C., R.A.F.O., No. 109 Sqn.—As captain of aircraft, this officer has participated in numerous attacks against heavily defended targets in Germany. He has consistently displayed skill and efficiency of a high order, while his magnificent fighting spirit and determination have been a notable feature of his operational tour.

Act. Sqn. Ldr. D. A. BROWN, D.F.C., R.A.F., No. 7 Sqn.—This officer has participated in many operational sorties which have included attacks against vital targets since the award of the D.F.C. He has set a magnificent example by his exceptional skill and coolness in the face of the enemy which has won the full confidence of his crew.

Act. Sqn. Ldr. J. H. C. CLARK, D.F.C., R.A.F.V.R., No. 460 (R.A.A.F.) Sqn.—Sqn. Ldr. Clark has completed many successful sorties since the award of the D.F.C. Despite intense opposition, he has, on all his operations, displayed a strong tenacity of purpose in pressing home his attacks. He has constantly set a fine example of fearlessness and gallantry which with his excellent captaincy and initiative has gained the admiration of the entire squadron.

Act. Sqn Ldr. R. DIXON, D.F.C., R.A.F.V.R., No. 7. Sqn.—Sqn. Ldr. Dixon has almost completed his second operational tour. He has at all times set an admirable example of efficiency and determination which has been a source of inspiration to all gunners in his squadron. By his skill and initiative he has largely contributed to the success of many missions. On one occasion, when acting as gunner, he destroyed an enemy fighter which attacked his aircraft.

Act. Sqn. Ldr. R. A. ESLER, D.F.C., R.A.F.V.R., No 109 Sqn.—This officer has completed numerous operations since the award of the D.F.C. Sqn. Ldr. Esler has proved himself an outstanding navigator of fine technical ability. As flight navigation leader his vast experience has been of great assistance to all navigators in his squadron. Always keen to operate against the enemy, his enthusiastic determination and devotion to duty have set an excellent example to all.

Act. Sqn. Ldr. G. H. GILBERT, D.F.C., R.A.F.V.R., No 105 Sqn.—Sqn. Ldr. Gilbert's first tour of operations included many low-level daylight missions. Since the award of the D.F.C. he has completed many more sorties with the same courage and devotion to duty which he has always shown. Under all conditions he has consistently shown cheerfulness and exceptional ability as a navigator. His operational conduct has been worthy of the highest praise throughout.

Act. Sqn. Ldr. T. W. G. GODFREY, D.F.C., R.A.F.V.R., No. 156 Sqn.—Sqn. Ldr. Godfrey is now on his second tour of operational duty. Apart from completing attacks on many heavily defended German targets, Sqn. Ldr. Godfrey has been on numerous sorties against military targets in France. He has consistently displayed great determination and keenness to operate against the enemy and by his coolness, tenacity and devotion to duty has achieved many successes.

Act. Sqn. Ldr. R. J. G. GREEN, D.F.C., R.A.F.V.R., No. 139 Sqn.—Since the award of the D.F.C. this officer has completed many more operational sorties. He is a capable and determined pilot whose courage and devotion to duty have been reflected in the many successes achieved by the crew of which he is captain.

Act. Sqn. Ldr. P. W. HELMORE, D.F.C., R.A.F.V.R., No. 105 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Helmore has displayed continued

NAVY MIXTURE: A Barracuda is brought up on to the flight deck of H.M.S. *Ravager*.

skill and tenacity of purpose during a large number of operational missions. His ability as a pilot has been of a very high order, while his courage and devotion to duty at all times have been most commendable.

Act. Sqn. Ldr. J. E. B. JEFFERSON, D.F.C., R.A.F.V.R., No. 105 Sqn.—Since being awarded the D.F.C. this officer has participated in a further number of operational sorties. An outstanding pilot, Sqn. Ldr. Jefferson has continued to display keenness, efficiency and great devotion to duty, setting a splendid example to all in his squadron.

Act. Sqn. Ldr. L. T. H. MAKEPEACE, D.F.C., R.A.F.V.R., No. 97 Sqn.—Since the award of the D.F.C., this officer has continued to render distinguished service as squadron navigational officer. He has completed a large number of operational sorties and has at all times displayed outstanding courage and devotion to duty. In August, 1944, Sqn. Ldr. Makepeace was navigator in an aircraft detailed for an operation over the shipping channel leading to Stettin. The identification of this narrow channel in an open expanse of water called for a high degree of navigational skill. This he accomplished successfully. While over the target area fierce fire was encountered from the ground defences and the aircraft badly damaged. With all navigation equipment unserviceable, Sqn. Ldr. Makepeace led his aircraft back safely to base.

Act. Sqn. Ldr. B. A. TEMPLEMAN-ROOKE, D.F.C., R.A.F.V.R., No. 576 Sqn.—This officer has completed many operational sorties against major German targets since the award of the D.F.C. On every occasion the attacks have been pressed home with the utmost determination and accuracy which has been confirmed by photographic evidence. As flight commander he has displayed outstanding leadership, sustained courage and initiative, which are worthy of high praise.

Act. Sqn. Ldr. E. R. THORN, D.F.C., D.F.M., R.A.F., No. 169 Sqn.—This officer has a long record of operational flying. As flight commander he has completed numerous sorties against a wide range of targets. At all times Sqn. Ldr. Thorn has set an outstanding example of leadership and devotion to duty of a high order which has played a large part in raising and maintaining the excellent standard of morale prevailing in his flight and squadron.

TOKYO BOUND: U.S. soldiers watch a Superfortress taking off from its coral runway on Saipan. From the narrow width and precipitous edge of the runway, it would appear that no swing during take-off is expected.

Royal Australian Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy in the South-West Pacific area:—

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. J. A. B. P. BOYD, D.F.C., R.A.A.F.

Distinguished Flying Cross

Act. Flt. Lt. I. J. L. WOOD, R.A.A.F.
Flt. Lt. F. N. R. THOMAS, R.A.A.F.
F/O. A. A. ETIENNE, R.A.A.F.

Royal Canadian Air Force

THE KING has been graciously pleased to approve the following award:—

Air Force Cross

F/O. H. W. WESTAWAY.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy.

Distinguished Flying Cross

Flt. Lt. W. I. DRINKALL, R.A.F.V.R., No. 692 Sqn.—For citation see Wing Cdr. GOSNELL, D.S.O., D.F.C.

Act. Flt. Lt. A. W. LOCKHART, A.F.C., R.C.A.F., No. 692 Sqn.—For citation see Wing Cdr. GOSNELL, D.S.O., D.F.C.

F/O. R. W. MCLEENON, R.A.F.V.R., No. 571 Sqn.—For citation see Wing Cdr. Gosnell, D.S.O., D.F.C.

F/O. J. R. WOOD, R.C.A.F., No. 692 Sqn.—For citation see Wing Cdr. Gosnell, D.S.O., D.F.C.

F/O. L. P. MARNEWECK, D.F.M., R.A.F.V.R., No. 161 Sqn.

F/O. W. F. MARTIN, R.A.F.V.R., No. 57 Sqn.

F/O. F. G. PARKER, R.A.F.V.R., No. 625 Sqn.

F/O. W. RICHARDSON, R.A.F.V.R., No. 434 (R.C.A.F.) Sqn.

F/O. J. W. STEWART, R.A.F.V.R., No. 626 Sqn.

F/O. W. A. TELLING, R.A.F.V.R., No. 626 Sqn.

F/O. O. G. THOMAS, R.A.F.V.R., No. 57 Sqn.

F/O. E. C. BOWLEY, R.A.F.V.R., No. 90 Sqn.

Act. F/O. J. NETHERWOOD, R.A.F.V.R., No. 106 Sqn.

Act. F/O. C. G. WEARMOUTH, R.A.F.V.R., No. 576 Sqn.

P/O. A. A. AVELINE, R.A.F.V.R., No. 97 Sqn.

P/O. D. BLAKE, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.

P/O. J. DAVIDSON, R.A.F.V.R., No. 300 Sqn.

P/O. R. J. GENT, R.A.F.V.R., No. 571 Sqn.

P/O. W. McG. MAIR, R.A.F.V.R., No. 626 Sqn.

P/O. A. J. MAXWELL, R.A.F.V.R., No. 625 Sqn.

P/O. C. MONKS, R.A.F.V.R., No. 425 (R.C.A.F.) Sqn.

P/O. K. POTTS, R.A.F.V.R., No. 51 Sqn.

P/O. W. E. ROGERS, D.F.M., R.A.F.V.R., No. 7 Sqn.

W/O. T. GRIFFITHS, R.A.F.V.R., No. 23 Sqn.

W/O. A. F. C. HARROW, R.A.F.V.R., No. 61 Sqn.

W/O. E. J. HOLLIS, R.A.F.V.R., No. 141 Sqn.

W/O. J. E. HUDSON, R.A.F.V.R., No. 83 Sqn.

W/O. T. J. MCLEAN, D.F.M., R.A.F.V.R., No. 617 Sqn.

W/O. D. MORRISON, D.F.M., R.A.F.V.R., No. 7 Sqn.

W/O. G. L. WATTS, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.

Act. W/O. I. O. HARRIS, R.A.F.V.R., No. 83 Sqn.

Act. W/O. W. G. TROTTER, R.A.F., No. 83 Sqn.

Act. W/O. H. WHITE, R.A.F.V.R., No. 300 Sqn.

P/O. P. W. ALLWOOD, R.A.A.F., No. 85 Sqn.

P/O. G. J. HENDERSON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.

P/O. E. J. H. ROBERTS, R.A.A.F., No. 61 Sqn.

P/O. V. J. ROBLEY, R.A.A.F., No. 83 Sqn.

P/O. J. R. TRENGOVE, R.A.A.F., No. 77 Sqn.

W/O. A. J. CROLL, D.F.M., R.A.A.F., No. 97 Sqn.

F/O. A. T. PATON, R.C.A.F., No. 419 (R.C.A.F.) Sqn.

F/O. L. PETERS, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

F/O. J. W. STRATH, R.C.A.F., No. 166 Sqn.

F/O. V. C. SUNSTRUM, R.C.A.F., No. 427 (R.C.A.F.) Sqn.

Act. Sqn. Ldr. G. M. LARSON, R.C.A.F., No. 432 (R.C.A.F.) Sqn.

Flt. Lt. R. A. ANDERSON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

Flt. Lt. M. A. J. BEAUDOIN, R.C.A.F., No. 630 Sqn.

Flt. Lt. F. B. BRADSHAW, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

Flt. Lt. L. B. BURNARD, R.C.A.F., No. 405 (R.C.A.F.) Sqn.

Flt. Lt. R. D. CHRISTIE, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

Flt. Lt. J. M. FAULDER, R.C.A.F., No. 408 (R.C.A.F.) Sqn.

Flt. Lt. A. GLUSTIEN, R.C.A.F., No. 405 (R.C.A.F.) Sqn.

Flt. Lt. E. G. GRAY, R.C.A.F., No. 405 (R.C.A.F.) Sqn.

Flt. Lt. F. E. LYNCH, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

Flt. Lt. H. M. SMITH, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

Act. Flt. Lt. T. E. C. AINSLEE, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

Act. Flt. Lt. D. R. BROWN, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

Act. Flt. Lt. M. D. CHISHOLM, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

Act. Flt. Lt. J. F. CORRIGAN, R.C.A.F., No. 7 Sqn.

Act. Flt. Lt. G. L. CRAIG, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

Act. Flt. Lt. J. O. DUNDAS, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

Act. Flt. Lt. V. T. FOWLER, R.C.A.F., No. 7 Sqn.

Act. Flt. Lt. H. J. FRITZ, R.C.A.F., No. 90 Sqn.

Act. Flt. Lt. R. W. HISCOTT, R.C.A.F., No. 405 (R.C.A.F.) Sqn.

Act. Flt. Lt. L. F. E. KEIGHLEY, R.C.A.F., No. 156 Sqn.

Act. Flt. Lt. W. W. KELLY, R.C.A.F., No. 900 Sqn.

Act. Flt. Lt. G. M. LOCKIE, R.C.A.F., No. 635 Sqn.

Act. Flt. Lt. N. G. MACLEOD, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

SERVICE

Act. Flt. Lt. H. C. MCVICAR, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

Act. Flt. Lt. C. C. MAGEE, R.C.A.F., No. 582 Sqn.

Act. Flt. Lt. C. W. NEVINS, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

Act. Flt. Lt. J. A. PARTRIDGE, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

Act. Flt. Lt. C. C. PUTERBOUGH, R.C.A.F., No. 214 Sqn.

F/O. D. A. ADAMS, R.C.A.F., No. 425 (R.C.A.F.) Sqn.

F/O. H. F. ARNOLD, R.C.A.F., No. 49 Sqn.

F/O. R. BAMFORD, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

F/O. R. K. BANISTER, R.C.A.F., No. 90 Sqn.

F/O. R. V. M. BARNETT, R.C.A.F., No. 100 Sqn.

F/O. G. G. BARTON, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

F/O. C. E. BENNETT, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

F/O. H. G. BILLINGSLEY, R.C.A.F., No. 434 (R.C.A.F.) Sqn.

F/O. J. R. BOWER-BINNS, R.C.A.F., No. 578 Sqn.

F/O. A. G. BROWN, R.C.A.F., No. 429 (R.C.A.F.) Sqn.

F/O. W. J. BROWN, R.C.A.F., No. 427 (R.C.A.F.) Sqn.

F/O. R. K. CARD, R.C.A.F., No. 432 (R.C.A.F.) Sqn.

F/O. W. P. CASEY, R.C.A.F., No. 138 Sqn.

F/O. H. E. DAMGAARD, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

F/O. E. S. DE BOW, R.C.A.F., No. 424 (R.C.A.F.) Sqn.

F/O. N. W. EMMOTT, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

F/O. E. EYJOLFSON, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

F/O. W. I. FENTON, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

F/O. J. R. FERRIS, R.C.A.F., No. 419 (R.C.A.F.) Sqn.

F/O. A. N. FERSTMAN, R.C.A.F., No. 431 (R.C.A.F.) Sqn.

F/O. J. C. C. FOLEY, R.C.A.F., No. 419 (R.C.A.F.) Sqn.

F/O. B. FRANKEL, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

F/O. K. R. FULTON, R.C.A.F., No. 426 Sqn.

F/O. J. A. GALBRAITH, R.C.A.F., No. 161 Sqn.

F/O. L. J. GALBRAITH, R.C.A.F., No. 76 Sqn.

F/O. R. M. GALLEN, R.C.A.F., No. 420 (R.C.A.F.) Sqn.

F/O. I. C. GRANT, R.C.A.F., No. 435 (R.C.A.F.) Sqn.

F/O. W. G. GRAY, R.C.A.F., No. 76 Sqn.

F/O. R. A. GRIMES, R.C.A.F., No. 405 (R.C.A.F.) Sqn.

F/O. T. S. HALL, R.C.A.F., No. 76 Sqn.

F/O. H. D. HALLADAY, R.C.A.F., No. 429 (R.C.A.F.) Sqn.

F/O. J. D. HAMILTON, R.C.A.F., No. 103 Sqn.

F/O. H. H. HAMMOND, R.C.A.F., No. 427 (R.C.A.F.) Sqn.

F/O. R. W. K. HEA, R.C.A.F., No. 218 Sqn.

F/O. T. HEALEY, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

F/O. T. HORBUL, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

F/O. L. G. HUGHES, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

F/O. H. J. HUMPHREY, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

F/O. H. JACKSON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.

F/O. F. G. KUEBLER, R.C.A.F., No. 429 (R.C.A.F.) Sqn.

F/O. H. W. LERTI, R.C.A.F., No. 166 Sqn.

F/O. J. D. LINKLATER, R.C.A.F., No. 433 (R.C.A.F.) Sqn.

Flt. Lt. C. G. WASHER, R.N.Z.A.F., No. 75 (N.Z.) Sqn.

Flt. Lt. R. R. BOUSKILL, R.C.A.F., No. 401 (R.C.A.F.) Sqn.

Act. Flt. Lt. D. G. BRANDRETH, R.A.F.V.R., No. 137 Sqn.

Act. Flt. Lt. J. D. HAWORTH, R.A.F.V.R., No. 266 Sqn.

Act. Flt. Lt. D. MCGIBBON, R.A.F.V.R., No. 266 Sqn.

P/O. R. W. COLE, R.A.F.V.R., No. 3 Sqn.

Flt. Lt. R. A. ADAMS, R.A.F.V.R., Nd. 515 Sqn.

F/O. J. R. LAKE, A.F.C., R.A.F., No. 515 Sqn.

P/O. T. A. K. GROVES, R.A.F.V.R., No. 515 Sqn.

P/O. R. E. PRESTON, R.A.F.V.R., No. 515 Sqn.

P/O. H. R. RUFFLE, R.A.F.V.R., No. 515 Sqn.

Act. F/O. D. K. GRATTON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.

F/O. L. N. B. CANN, R.A.F.V.R., No. 156 Sqn.

Sqn. Ldr. J. C. BUTTON, R.A.F.V.R., No. 193 Sqn.

Act. Sqn. Ldr. D. L. BROWN, R.A.F.V.R., No. 98 Sqn.

Act. Sqn. Ldr. A. H. SMITH, R.N.Z.A.F., No. 197 Sqn.

Act. Sqn. Ldr. R. L. STILLWELL, D.F.M., R.A.F.V.R., No. 122 Sqn.

Act. Sqn. Ldr. J. D. WRIGHT, R.A.F.V.R., No. 266 Sqn.

AVIATION

Flt. Lt. G. S. BLISS, R.A.F.V.R., No. 21 Sqn.
Flt. Lt. L. W. BURT, R.A.F.V.R., No. 2 Sqn.
Flt. Lt. G. H. CORRIGAN, R.C.A.F., No. 2 Sqn.
Flt. Lt. J. R. CULLEN, R.N.Z.A.F., No. 486 (N.Z.) Sqn
Flt. Lt. M. LISSNER, R.A.F.V.R., No. 268 Sqn.
Flt. Lt. C. SCOBIE, R.A.F., No. 613 Sqn.
Flt. Lt. D. W. SHANAHAN, R.A.F.V.R., No. 107 Sqn.
Flt. Lt. J. WHITTLE, R.A.F.V.R., No. 107 Sqn.
Flt. Lt. R. H. G. WEIGHILL, R.A.F.V.R., No. 2 Sqn.
F/O. E. R. BOWDEN, R.A.F.V.R., No. 88 Sqn.
F/O. E. T. CATHCART-CUNNISON, R.A F.V.R., No. 266 Sqn.
F/O. K. L. B. CUDLIPP, R.A.F.V.R.
F/O. G. A. H. FIELD, R.N.Z.A.F., No. 226 Sqn.
F/O. F. JENKINS, R.C.A.F., No. 268 Sqn.
F/O. A. H. MCKEE, R.A.F.V.R., No. 21 Sqn.
F/O. A. A. MOYER, R.C.A.F., No. 226 Sqn.
F/O. B. F. N. RACHINGER, R A A.F., No. 268 Sqn.
F/O. R. G. ROWELL, R.A.A.F., No. 464 Sqn.
F/O. D. C. USHER, D.F.M., R.A.F.V.R., No. 74 Sqn.
F/O. I. M. WILLIAMS, R.A.F., No. 98 Sqn.
P/O. E. DEAN, R.A.F.V.R., No. 180 Sqn.
P/O. G. K. E. MARTIN, R.A.A.F., No. 609 Sqn.
W/O. M. H. BELL, R.A.A.F., No. 19 Sqn.
W/O. (now P/O.) W. J. L. SHEEHAN, R.A.F.V.R., No. 69 Sqn.
Sqn. Ldr. D. C. PRITCHARD, R.A.F.O., No. 143 Sqn.
Act. Sqn. Ldr. W. E. EAGLETON, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. B. S. IMRIE, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. G. WATSON, R.A.F.V.R., No. 540 Sqn
W/O. J. MCG. MACARTHUR, R.A.F.V.R., No. 540 Sqn.
F/O. F. T. GRIFFEN, R.A.A.F., No. 463 (R.A.A.F.) Sqn.
F/O. W. C. KENT, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
F/O. R. R. KINGSLAND, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
P/O. J. H. R. COURTOIS, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. E. R. MCROBIE, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. I. B. TODD, R.C.A.F., No. 425 (R.C.A.F.) Sqn.
Act. F/O. A. E. THOMAS, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
W/O. R. T. BUTLER, R.A.F.V.R., No. 46 Sqn.
W/O. R. F. GRAHAM, R.A.F.V.R., No. 46 Sqn.
W/O. D. R. JENNINGS, R.C.A.F., No. 214 Sqn.
Sqn. Ldr. E. R. BITMEAD, R.A.F.
Act. Sqn. Ldr. K. M. CARVER, R.A.F.V.R., No. 605 Sqn.
Act. Sqn. Ldr. N. CAMERON, R.A.F.V.R., No. 258 Sqn.
Act. Sqn. Ldr. A. M. GILL, R.A.F.V.R., No. 84 Sqn.
Act. Sqn. Ldr. L. C. C. HAWKINS, R.A.F.V.R., No. 135 Sqn.
Act. Sqn. Ldr. A. J. PICKNETT, R.A.F.V.R., No. 231 Sqn.
Act. Sqn. Ldr. C. H. POTTER, R.A.F.V.R., No. 295 Sqn.
Act. Sqn. Ldr. J. STEWART, R.A.F., No. 570 Sqn.
Flt. Lt. P. V. AYERST, R.A.F.O., No. 124 Sqn.
Flt. Lt. J. W. BRADLEY, R.A.F.V.R.
Flt. Lt. D. S. HANDLEY, R.A.F.VR., No. 151 Sqn.
Flt. Lt. M. KELLET, R.A.F.V.R., No. 504 Sqn.
Flt. Lt. J. S SLANEY, R.A.F.V.R., No. 245 Sqn.
Flt. Lt. J. RALPH, R.A.F.V.R., No. 295 Sqn.
Flt. Lt. L. A. St. C. WATSON, R.A.F.V.R., No. 165 Sqn.
F/O. G. F. AYTON, R.A.F., No. 151 Sqn.
F/O. R. R. F. BRUCE, R.A.F.V.R., No. 418 (R.C.A.F.) Sqn.
F/O. H. H. HANCOCK, R.A.F.V.R., No. 299 Sqn.
F/O. B. JOB, R.A.F.V.R., No. 418 (R.C.A.F.) Sqn.
F/O. J. A. PRITCHARD, R.A.F.V.R.
P/O. R. H. MACDONALD, R.A F.V.R., No. 211 Sqn.
W/O. G. R. FREEMAN, R.A.F.V.R., No. 211 Sqn.
W/O. G. Y. MANDERSON, R.A.F.V.R., No. 211 Sqn.
Sqn. Ldr. D'A. J. HAWKE, R.A.A.F., No. 84 Sqn.
F/O. A. J. HUGHES, R.A.A.F.
F/O. F. E PASCOE, R.A.A.F., No. 190 Sqn.
Flt. Lt. P. R. BROOK, R.C A.F., No. 418 Sqn.
Flt. Lt. D. W. CONNOR, R.C.A.F.
Flt. Lt. J. H. PHILLIPS, R.C.A.F., No. 418 Sqn.
Act. Flt. Lt. D. R. ROBERTSON, R.C.A.F., No. 190 Sqn.
F/O. L. A. TAPP, R.C.A.F., No. 684 Sqn.
P/O. R. J. O'MARA, R.C.A.F., No. 211 Sqn.
Flt. Lt. G. S. BECA, R.N.Z.A.F., No 99 Sqn.
F/O. C. L. SIEGERT, R.N.Z.A.F., No 190 Sqn.
P/O. N. W. SUTHERLAND, R.N.Z.A.F., No. 190 Sqn.
Flt. Lt. P. HILLWOOD, R.A.F.V.R., No. 127 Sqn.
Flt. Lt. G. R. I. PARKER, D.S.M., R.A.F., No. 219 Sqn.
Flt. Lt. B. F. MIDDLETON, R.C.A.F., No. 422 (R.C.A.F.) Sqn.
Flt. Lt. G. WONNACOTT, R.C.A.F., No. 414 (R.C.A.F.) Sqn.
Act. Flt. Lt. W. H. B. SHORT, R.A.F.V.R., No. 137 Sqn.
Act. Flt. Lt. P. H. STRONG, R.A.A.F., No. 182 Sqn.
F/O. L. F. BERRYMAN, R.C.A.F., No. 412 (R.C.A.F.) Sqn.
F/O. J. M. BROWN, R.A.A.F., No. 69 Sqn.
F/O. W. J. L. S. LOWES, R.A.F.V.R., No. 247 Sqn
F/O. L. F. MAY, R.C.A.F., No. 414 (R.C.A.F.) Sqn.
F/O. A. B. E RUTHERFORD, R.A.F.V.R., No. 182 Sqn.
F/O. N. E. WESTERGAARD, R.A.F.V.R., No 619 Sqn.
P/O. G. CLUBLEY, R.A.F.V.R., No. 191 Sqn.
W/O.1 B. A. M. FOX, R.C.A.F., No. 614 Sqn.
F/O. M. PRYSZLAK, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. L. E. J. RANEY, R.C.A.F., No. 429 (R.C.A.F.) Sqn
F/O. D. G. RAY, R.C.A.F., No. 12 Sqn.
F/O. J. P. RENNIE, R.C.A.F., No. 550 Sqn.
F/O. K. P. J. REID, R.C.A.F., No. 578 Sqn.
F/O. C. M. SINGLETON, R.C.A.F., No. 77 Sqn.
F/O. J. H. SINCLAIR, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. E. C. SLESSOR, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. R. A. TORGRIMSON, R.C.A.F., No. 625 Sqn.
F/O. H. A. VERNON, R.C.A.F., No. 12 Sqn.
F/O. L. W. WEBB, R C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. T. E. WORDSWORTH, R.C.A.F., No. 424 (R.C.A.F.) Sqn.
F/O. T. S. WRIGHT, R.C.A.F., No. 578 Sqn.
F/O. R. F. ANTHONY, R.C.A.F., No. 432 (R.C.A.F.) Sqn.
F/O. P. C. CADEGAN, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. R. G. HERBERT, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. J. A. KICAK, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O. D. C. MURRAY, R.C.A.F., No. 35 Sqn.
F/O. L. W. PETRICK, R.C.A.F., No. 50 Sqn.
P/O. J. D. BILL, R.C.A.F., No. 635 Sqn.
P/O. J. R. BRAY, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
P/O. D. L. BREWER, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
P/O. M. B. CARDNO, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
P/O. D. E. CARRUTHERS, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. F. S. GONSALVES, R.A.F.V.R., No. 85 Sqn.
Act. Flt. Lt. C. W. JACKSON, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
Act. Flt. Lt. F. N. LAWRENCE, R.A.F.V.R., No. 10 Sqn.
F/O. G. H. CHESHER, R.A.F.V.R., No. 280 Sqn.
F/O. W. N. COSMAN, R.C.A.F., No. 248 Sqn.
F/O. J. A. ENNS, R.C.A.F., No. 524 Sqn.
F/O. A. W. LANE, R.A.A.F., No. 462 (R.A.A.F.) Sqn.
Act. F/O. H. D. MELVILLE, R.A.F.V.R., No. 578 Sqn.

Distinguished Flying Medal

Flt. Sgt. D. L. GODFREY, R.A.F.V.R., No. 219 Sqn.
Flt. Sgt. E. H. MCKENNA, R.A.F.V.R., No. 418 (R.C.A.F.) Sqn.
Flt. Sgt. H. C. H. D WOOD, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. J. D. MCK. INGLIS, R.A.F.V.R., No. 97 Sqn
Sgt. D. R. BISHOP, R.A F.V.R., No. 15 Sqn.
Sgt. M. H. A. CAMPBELL, R.A.F.V.R., No. 300 Sqn.
Sgt. G. A. C. DUHIG, R.A.F.V.R., No. 77 Sqn.
Sgt. H. T. GODWIN, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. N. J. HAWBELECHO, R.C.A.F., No. 576

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations conferred upon the personnel indicated in recognition of valuable services rendered in connection with the war:—

Conferred by the President of the United States of America

Distinguished Flying Cross

Flt. Lt. R. H. BALFOUR, R.N.Z.A.F.

Air Medal

F/O. G. E. GUDSELL, R.N.Z.A.F.

Roll of Honour

Casualty Communiqué No. 458.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 22 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. H. P. Bartram; Sgt. E. F. Bonser; Sgt. H. H. Brown; Flt. Sgt. A. H. Busbridge; Sgt. G. Covell; Sgt. A. Craig; Sgt. A. Downie; Sgt. W. A. Dyer; Sgt. R. W. Gibbs; Act Flt. Lt. D. C. Haggis; Sgt. E. H. Harris; Flt. Lt. R. N. Henderson; Flt. Sgt. M. G. G. Hunter-Muskett; Flt. Sgt. W. F. Insley; P/O. T. G. Leishman; Flt. Sgt. J. McArdle; Flt. Sgt. T. G. McLaughlin; F/O. G. D. Mathias; W/O. N. B. J. Melrose; Sgt. J. A. Miller; Flt. Sgt. B. V. Mowan; Flt. Sgt. E. G. Murray; Sgt. K. J. Shay; Sgt. A. B. Sleep; Flt. Sgt. T. R. G. Owen.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. E. H. G. Dyer; Act. Flt. Lt. W. O. Peacock; Sgt. H. E. Thompson; Sgt. G. A. Wright.

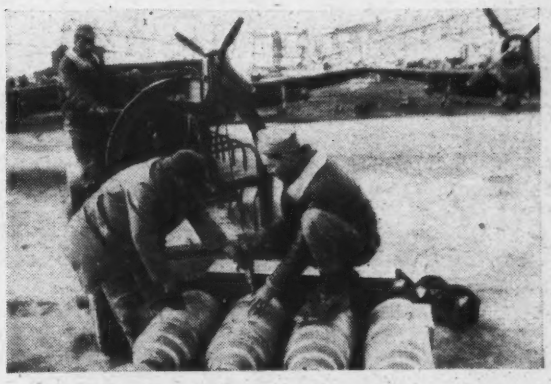
WOUNDED OR INJURED IN ACTION.—Sgt. D. E. David; Sgt. T. E. Jenkins.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. J. H. R. Bowtell; P/O. W. G. Mair.

MISSING, BELIEVED KILLED IN ACTION.—Act. Flt. Lt. G. H. Calveley; Flt. Sgt. R. H. E. Collinson.

MISSING.—Sgt. K. E. C. Adams; Sgt. R. J. Adams; Sgt. H. M. Atherton; F/O. H. T. G. Atkinson; Flt. Sgt. R. R. Baines; F/O. J. F. Baird; P/O. J. Barnett; Sgt. A. A. Beale; Sgt. J. Bell; F/O. J. Bell, D.F.C.; Flt. Sgt. F. W. A. Bickmore; Sgt. L. F. Bonnet; Sgt. J. A. Bowen; Flt. Sgt. W. McG. H. Burnett; Sgt. J. J. Carey; Flt. Lt. W. H. M. Carrington; Sgt. J. E. Cartwright; F/O. G. R. Chaffe; W/O. P. W. Chattin; F/O. S. A. Clack; Flt. Lt. D. Clark; Sgt. D. R. Clatworthy; Flt. Sgt. W. R. Clifton; Sgt. R. N. Collins; Sgt. C. W. Connolly; Flt. Sgt. R. V. Cooling; P/O. G. Curless; Sgt. R. G. Curtis; Sgt. T. H. Davies; Flt. Sgt A. Dickson; Flt. Sgt. F. C. A. Dow; Flt. Lt. G. E. Dunfee; F/O. F. R. Dunton; P/O. R. Dutton; F/O. B. R. Dwyer; F/O. G. J. Elliott; Flt. Sgt. S. Elliott, A.F.M.; Sgt. D. Emmott; Flt. Sgt. E. F. Evans; Flt. Sgt. J. A. Evans; Flt. Sgt. J. G. Evans; Sgt. R. F. J. Franklin; Flt. Sgt. W. E. Frew; Flt. Sgt. J. C. Fullerton; Flt. Sgt. C. Glynn; F/O. S. W. Greengrass; Sgt. C. C. Grego; Sgt. W. H. Grice; W/O. F. W. Griffiths; Sgt. T. R. L. Griffiths; Flt. Lt. D. D. Hall; L.A/C. A. Halstead; Sgt. R. Hancock; Sgt. J. E. Harling; Flt. Sgt. H. H. Hartley; Flt. Sgt A. V. Howarth; Flt. Lt. B. J. Hughes; Sgt. R. E. Ives; P/O. F. E. James; Flt. Sgt. T. E. Jenkins; P/O. R. C. M. Jones; Sgt. R. D. Kempthorne; Sgt. J. Knight; Flt. Lt. S. G. J. Lane; F/O. B. S. Leuty; Sgt. B. E. Lever; Sgt. L. G. Lewis; Flt. Lt. W. S. Lough; Flt. J. McA. Loughran; W/O. J. McCartney; W/O. A. W. McGinnis; Sgt. D. C. McLachlan; Sgt. E. L. McLaren; F/O. F. H. T. McNally; F/O. L. F. A. Marston; Flt. Lt. C. V. Mason; F/O. J. Maule; Sgt. L. K. Matthews; Sgt. P. W. L. Moore; Sgt. C. M. Murray; Sgt. J. D. Murphy; Sgt. D. J. Neale; Sgt. W. F. Noble; Sgt. D. G. Northcott; Act. Flt Lt. D. Ovenstone; Sgt. J. W. W. Overee; Sgt. R. G. Pain; Flt. Sgt. R. Patriarca; F/O. M. F. Payne; Sgt. J. H. Peake; Sgt. M. J. Pearson; Act. Sqn. Ldr. A. S. Perkins; F/O. R. A. Pitts; Sgt. C. L. Plant; Sgt. M. S. Popple; Sgt. W. E. Pullen; Flt. Sgt. H. R. Read; Sgt. A. J. Richard; Flt. Sgt. D. Rowell; Flt. Sgt. R. Smith; W/O. E. Smith; Sgt. T. D. Smith; Sgt. T. F. Smith; Sgt. H. Souci; L.A/C. J. A. W. Statham; Flt. Sgt. R. E. Steed; Flt. Sgt. C. W. Stogdale; Sgt. J. R. Stone; Sgt. J. W. Street; Flt. Sgt. J. W. Swannell; Sgt. W. H. Swingler; Sgt. R. A. Swolf; W/O. E. J. Taylor; Flt. Lt. E. A Taylor; W/O. F. L. Taylor; Sgt. A. E. J. Thorne; Sgt G. A. Vaughan; Sgt. R. F. Vicary; F/O. S. G. A Warner; F/O. J. H. L. Watkins; Sgt. A. Watton; Flt. Sgt. D. H. Watts; Sgt. D. A. Webb; Act. Sqn. Ldr. J. E. White; Sgt. R. Whittle; Flt. Lt. R. A. Willis; Sgt. F. J. Wilson; Flt. Sgt. A. E Windle; Sgt. H. C. J. Winslade; F/O. G. E. Woode; Sgt. D. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. F. Marlor; W/O. R. D. Smart.



LATIN-AMERICAN AID: A Brazilian fighter squadron is now operating in Italy. Brazilian ground staff prepare to load 500-lb. bombs on to the Thunderbolts with which the squadron is equipped.

SERVICE AVIATION

KILLED ON ACTIVE SERVICE.—Sgt. F. Beeby; W/O. H. L. Butler; Flt. Lt. D. A. W. Clarke; Flt. Lt Cumberworth; P/O. J. Esdale; Flt. Sgt. L. Handford; Flt. Lt. I. A. Jones; W/O. G. H. Middleton; Flt. Sgt. F. Nevin.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. N. S. Curtis; Sgt. C. Hill; Sgt. P. I. Smith; Sgt. W. Wharton; Sgt. D. G. Woods; Sgt. G. G. Worley.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. J. T. Bowskill; F/O. L. P. H. Cole; L.A/C. C. Jackson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. E. Sanderson.

DIED ON ACTIVE SERVICE.—L.A/C. F. W. Anderson; Sgt. J. C. Bathgate; L.A/C. G. A. Blackman; F/O. W. Clements; Sqn. Ldr. W. R. Davies; A/C.2 J. Evans; Cpl. A. E. Flello; Cpl. L. F. George; L.A/C. H. W. S. Hay; L.A/C. H. Jones; Sqn. Ldr. M. G. Kelly; Cpl. A. J. King; Act. Flt Lt. D. R. Lee; Act. Sqn. Ldr. T. G. O'Neill; L.A/C. E. J. Pace; Sgt. W. Rae; A/C.1 F. Ravenscroft, L.A/C. T. P. Saunders; Sgt. R. W. Walters; A/C.1 J. R. Wilkinson; Sgt. A. Williams.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. E. L. M. Cooper; A/CW.2 D. Poling.

Royal Australian Air Force

KILLED IN ACTION.—F/O. P. W. W. Richardson; F/O. S. C. Youl.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. J. Battle, F/O. J. O. Boyd; Flt. Sgt. W. F. Burge; Flt. Sgt. R. O Cole; Sgt. N. Fisher; Flt. Sgt. L. W. Heason; Flt. Sgt A. M. Kearney; F/O. N. G. McIntyre; F/O. A. R. Mitchell; Flt. Sgt. I. R. Phelan.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. K. P. Brady; Act. F/O. J. C. Oram; Flt. Sgt. C. J. Potter; Act. F/O. K. J. Sullivan.

MISSING.—Flt. Sgt. E. J. Anderson; F/O. A. J. Brady; P/O J. H. N. Cleminson; P/O. J. T. N. Frost; Flt. Sgt. F. I. Griffin; Flt. Sgt. R. E. Harding; F/O. F. S. Hawkes; P/O. L. D. Heath; Flt. Sgt W. W. Hiscock; F/O. K. A. Howard; Flt. Sgt. A. S. Jackson; Flt. Sgt. K. K. Kempson; Flt. Sgt N. R. Kerr; Flt. Sgt. G. J. K. Laidler; Flt. Lt. R. W. Litchfield; Act. F/O. T. N. McCurdy; Flt Sgt. J. McWhinney; Flt. Sgt. C. A. F. Murray; Flt Sgt. J. W. Perrie; Flt. Sgt. R. H. C. Peut; Flt. Sgt. D. K. Powers; Act. F/O. W. P. Quan; F/O. D. J. Sandell; Flt. Sgt. S. S. Solomons; P/O K. G. Tennant; Flt. Sgt. J. B. Ware; Flt. Sgt. A. G. Webber.

MISSING BELIEVED KILLED ON ACTIVE SERVICE.—F/O. D. G. F. MacRae; P/O. E. S. Taylor.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. S. A. Abbott; P/O. R. H. Beddoe; Flt. Sgt. T. R. Dent; Flt. Sgt. B. M. Glover; Flt. Sgt. D. H. Ryan; Flt. Sgt. F. M. Walker; Flt. Sgt. B. E. Wigley.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. J. C. Lyster.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. A. W. Campbell; Sgt. L. F. Fletcher; F/O. E. E. Freeman; F/O. J. A. Glenn; F/O. L. W. Gray; Flt. Sgt. H. B. Hamilton; Flt. Lt. C. M. Howes; F/O. G. W. McCartney.

MISSING.—F/O. E. J. Allen; F/O. J. H. Bringloe; P/O. W. S. Bryans; F/O. A. T. Clark; F/O. M. W. Coles, D.F.C.; Flt. Lt. C. E. Darby, D.F.M.; P/O. A. R. Elliot; F/O. R. S. Forestell; P/O. B. A. Gauthier; F/O. R. B. Gray; Sqn. Ldr. J. A. Hanway, A.F.C.; Flt Sgt. W. I. Harris; Flt. Sgt. D. J. Heath; P/O D. L. S. Henderson; F/O. A. J. Hoddinott; Flt Sgt. L. K. Johnson; Flt. Lt. F. A. J. Kemper; F/O. S. N. Kwinter; P/O. H. W. Lugg; P/O. R. H. McNabb; Flt. Sgt. J. M. Richardson; F/O. T. C. Robb; F/O. I. C. Robbie; P/O. T. B. Sparrow; P/O. M. Stern; P/O. L. S. Tobin; P/O. A. J. Venn; P/O D. S. Whiting; Flt Sgt. N. S. Yates.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. C. Brown; Sgt. A. D. Daniels; Sgt. R. C. Green; Flt. Sgt. D. J. McAllister; Flt. Sgt. J. L. Murray; Sgt. W. S. Paton; P/O. J. M. Rinahan.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. A Kinmond.

DIED ON ACTIVE SERVICE.—F/O. A. W. Ross; P/O. W. M. Young.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. C. B. Oxenham; P/O J. W. Waddell

MISSING, BELIEVED KILLED IN ACTION.—F/O. I. C. Hutcheson.

MISSING.—W/O. K. L. Boyd; F/O. J. G Cahir; Flt. Sgt. P. O'Callaghan; F/O. G. K. Christensen; Flt. Lt. B. G. Collyns; Act. F/O. D. F. Holder; Flt. Lt. D. L. Knobloch; Act. F/O. A. G. Russell; Act. Flt. Lt. C. J. Taylor.

KILLED ON ACTIVE SERVICE.—P/O. H. G. Round.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. J. D. Forbes.

DIED ON ACTIVE SERVICE.—Flt. Sgt. C. A. Philpott.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—W/O. A. D. Hall.

South African Air Force

WOUNDED OR INJURED IN ACTION.—Lt. P. D Hey.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Lt. D. K. Stewart.

MISSING.—Lt. P. St. J. Alexander; W/O. H. J. Brown; W/O. P. A. Creux; Lt. P. O. Dawber; Lt. G. H. W. Downer; Lt. D. D. Gordon; Lt. S. B. Haagner; Lt. J. V. Hall; Cpl. P. M. R. Hodoul; Lt. K. A. Kelley; Capt. J. H. G. Klompje; Lt. B. J. Marais; Lt. P. J. Mockford; Lt. F. H. Mollett; Capt. J. F. Munro; Lt. H. Salbot; Lt. R. D. Van-Derspuy.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—I. M. Dolby; Air Mech. Van Ryan.

NO PICNIC : A winter scene at a bomb dump in N.W. Europe, where R.A.F armourers are striving to haul 1,000-pounders through the mud.

Official Corrections

Casualty Communiqué No. 453.

Under "MISSING," delete Sgt. G. E. Bower and Sgt. L. E. Westbrook

R.C.A.F.—Under "MISSING," for Flt. Sgt N. Cushman read P/O. N. Cushman.

R.N.Z.A.F.—Under "MISSING," delete F/O. B. C. Baker.

Casualty Communiqué No. 454.

Under "MISSING," delete Sgt. W. H. J. Cowan; P/O. D. J Fry; P/O. W. L. Harris; Sgt. B. Jones; Sgt. W. Longmore; Flt. Sgt. G. Pristupa; Act. F/O H. A. L Wagner; F/O. K. G. Walker; P/O. E. Williams. For Act. Flt. Lt. J. G. McCall read Flt. Lt. J. G. McCall.

R.C.A.F.—Under "MISSING," delete F/O. W. Dinney. For W/O. E. S. Carey read P/O. E. S. Carey; for W/O. J. C. Durrant read P/O. J. C. Durrant; for W/O. J. B. Grady read P/O. J. B. Grady; for Flt. Sgt. A. Watt read P/O. A. Watt.

S.A.A.F.—Under "MISSING," delete Capt. J. J. Booyens and F/O. P. C. J. Strutt.

Casualty Communiqué No. 455.

Under "MISSING," delete Flt. Lt. D. G. Belyea; Sgt G. E. Benson; F/O. A. H. Birch; Sgt. H. H. Blake; Sgt. J. A. Boyes. For P/O. A. A. A. Bradley read F/O. A. A. A. Bradley. Delete Sgt. I. P. Cundall; P/O. R. L. Giblett; Flt. Lt. A. Hannay; Sgt. C. T. Keeling; Sgt. J. W. Lovatt; Flt. Sgt. D. MacTaggart; Sgt. D. C. Matthews; Sgt B. R. J. Pring.

R.A.A.F.—Under "MISSING," delete Flt. Sgt. B. P. Molloy.

R.C.A.F.—Under "MISSING," for Sgt. J. F. Andrews read P/O. J. F. Andrews; for Flt. Sgt. B. G. Betts read P/O. B. G. Betts; for Sgt. D. F. Currie read P/O. D. F. Currie; for Flt. Sgt. J. F. Dalessandro read P/O. J. F. Dalessandro; for Flt. Sgt. A. J. Dickinson read P/O. A. J. Dickinson; for Flt. Sgt. L. P. Galvin read P/O. L. P. Galvin; for Flt. Sgt. A. F. Nevin read P/O. A. F. Nevin; for Flt. Sgt. R. E. Patterson read P/O. R. E. Patterson; for Flt. Sgt. J. J. Pearson read P/O. J. J. Pearson; for Flt. Sgt. D. W. Peers read P/O. D. W. Peers; for Sgt. F. G. Plecan read P/O. F. G. Plecan; for Flt. Sgt. J. R. Power read P/O. J. R. Power; for Flt. Sgt. C. V. R. Wigley read P/O. C. V. R. Wigley.

Casualty Communiqué No. 456.

Under "KILLED IN ACTION" for Flt. Sgt. R. J Anderson read W/O. R. J. Anderson.

Under "MISSING" delete P/O. F. F. H. Burnett, Flt. Lt. E. M. Collard, Act. Flt. Lt. P. A. T Facer. For Sgt. F. S. G. Heal read Flt. Sgt. F. S. G Heal. Delete F/O. S. D. Thyagerajan.

R.A.A.F.—Under "KILLED ON ACTIVE SERVICE" for W/O. G. L. Allan read P/O. G. L. Allan.

R.C.A.F.—Under "KILLED IN ACTION" for Sgt. E. G. Beard read P/O. E. G. Beard, for W/O G. V. A. Butchart read P/O. G. V. A. Butchart, for Flt. Sgt. F. W. Crawley read P/O. F. W Crawley, for Flt. Sgt. J. J. Grant read P/O. J. J. Grant. Delete W/O. W. H. Ferris.

Under "WOUNDED OR INJURED IN ACTION" insert Sgt. K. T. Bielby, F/O. W. B. Rosen. Delete these names from "DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION."

Under "MISSING" the following should rank as P/Os. :—Flt. Sgt. T. L. Baker, W/O. F. D. Billingsley, Sgt. R. R. Boyce, W/O. J. B. Cleaver, W/O. G. E. Germiquet, Flt. Sgt. P. C. Revell, Sgt. A. G. Roski, Sgt. D. E. Snell, W/O. C. P. Surles

Under "KILLED ON ACTIVE SERVICE" for W/O F. Bradley read P/O. F. Bradley, for W/O. M Regenstreif read P/O. M. Regenstreif.

S.A.A.F.—Under "MISSING" delete W/O. D. A. Wooldridge.

Casualty Communiqué No. 457.

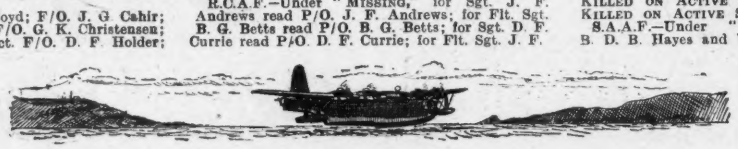
Under "MISSING" delete Flt. Lt. J. K. Haseldeu, Sgt P. F. Heath, Sgt. N. H. A. Osmond, Sgt. P. J. Potts, Sgt. A. J. Rampley, F/O. C. R. E. Russell, Sgt. G. H. Smith, Sgt. J. F. Wright.

Under "KILLED ON ACTIVE SERVICE" delete P/O. J. E. A. Jones, and transfer to "DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE."

Under "PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR," delete Sgt. N. S. Alkemade.

R.C.A.F.—Under "KILLED IN ACTION," for Flt. Sgt. S. J. Levesque read P/O. S J. Levesque.

Under "MISSING" the following should rank as P/Os: Flt. Sgt. E. F. Christy, Flt. Sgt. R. G. Grout, Flt. Sgt. S. L. Peters, Sgt. J. J. Ringer.

For "PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE," read "PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE."

S.A.A.F.—Under "MISSING" delete W/O. B. D. B. Hayes and W/O. I. C. J. Jansen.